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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Trucks and Tractors Discussed at Chicago S. A. E. Meeting

Most of the professional sessions given over to discussion of maintenance and service problems. Truck fleet operation and the application of power to trucks are also considered. 500 attend the dinner.

By J. Edward Schipper

ENGINEERING activities during Chicago show week centered in the S. A. E. meeting. Professional sessions occupied an entire day and were followed by a dinner attended by over 500 members and guests.

The first session was given over to the subject of trucks and the second to maintenance and operation. The morning session included papers by L. L. Scott on steam power applied to a truck; N. J. Ocksreider on engineering analysis applied to truck selling and Capt. J. B. Haney on progress in design of ordnance equipment.

The afternoon session, which took up maintenance and operation, also had a program of three papers. N. J. Smith spoke of truck fleet operation, J. C. Thorpe on tractor service requirements, and T. F. Cullen on designing to facilitate service work. At the banquet H. L. Horning acted as toastmaster. The speakers were: David Beecroft, directing editor of the Class Journal publications and president of the S. A. E.; H. H. Merrick, president Great Lakes Trust Co., and Prof. John Paul Good of the University of Chicago.

The feature of the meeting was the discussion of truck operation maintenance and sales.

N. J. Smith, who is manager of truck maintenance of the Consumers Co., Chicago, spoke of the good results obtained by carrying maintenance to the greatest possible efficiency. The Consumers Co. operates over 150 trucks and by the system used under Smith's jurisdiction every one of these trucks receives a thorough inspection every night. A number of specially drilled men organized into specializing groups take care of the cleaning, lubricating and mechanical upkeep of these vehicles. The trucks in use there, as was brought out in the discussion, average about 1000 miles a month. They are washed every night and after the washing is completed they are checked over and must be satisfactory to the inspector before they are allowed to go out on the next day's work.

By carefully lubricating the trucks and by changing the oil as often as required, an astonishingly low upkeep cost has resulted. While it is true that the overhead of maintenance has somewhat increased by the elaborate care given, the cost of operating the fleet has been materially reduced in the long run and the depreciation of the equipment has been cut down to the limit. A number of questions put to Mr. Smith by the truck men present brought out some interesting information.

For instance, it developed that an average of 10,000 miles is secured on a set of tire chains. This figure does not apply to all classes of work, for in hauling coal it is possible to get an average of 15,000 miles

to the set of chains while in hauling stone or sand the mileage will be considerably shorter.

Regarding the regrinding of cylinders, Mr. Smith stated that he could not lay down any set rule. Some cylinders have run 30,000 miles without regrinding, while others have run shorter or longer than this distance by a very large margin. One of the members inquired regarding the regrinding of crankshafts, to which the speaker replied that he had not reground a crankshaft for four years. He stated that shafts which had been measured after having been in service for this length of time showed less than .002 in. wear.

Another variable factor in maintenance is the friction disk on the clutch. Some have to be refaced in one month while others will run for years. He thought that an average figure would be in the neighborhood of one and one-half or two years.

Smith has a man whose entire time is taken up by fuel and oil research. As a result mileage on fuel and oil has been continually increasing. This is accomplished by absolutely correct setting of carbureter and spark for each truck, by seeing that the proper timing of the valves and their correct setting is not departed from and also by the use of up-to-date devices which would tend to better conditions necessary to the attainment of economy. Crankcase oil, after it has been withdrawn when the oil is changed, is utilized for the lubrication of hoists and for other auxiliary machinery about the garage. Mr. Smith is at present experimenting with reclaimed oil for the cylinder lubrication, but has not as yet arrived at a definite conclusion.

Considerable interest and some amusement was expressed by the hearers to Mr. Smith's frank reply to the question of whether or not he was overloading his trucks. He stated bluntly that he is. He amplified his statement however by saying that the overload was compensated for by insisting that the trucks be never overspeeded. He confessed that the overloads sometimes amount to 30 per cent but said that overspeeding is far more damaging to the truck than overloading, hence the rigid rule against excessive speed.

N. J. Ocksreider, in his talk on engineering analysis applied to truck selling, divided his topics into two heads, first, the analysis of a given market, and second, the ability to analyze the transportation needs of the prospect. As an example of what he meant by proper analysis of the truck market he pointed out that a city district might be divided according to area, and while superficially all of the salesmen were allotted equal territories, the potential market in one division of the district might be far greater than in another. He outlined the necessity for making a careful study of all the factors involved in determining the number of actual prospects and the actual number of trucks required to meet all the transportation problems of any given district. Mr. Ocksreider, by his analysis, made clear the importance of apportioning sales effort and expense according to the possibilities of any definite areas.

The other phase of analysis applied to truck selling is in the use of engineers equipped to enter the establishment of a prospect and to properly analyze the truck equipment necessary to most efficiently handle the transportation problem involved. The factors taken into consideration include not only the number of trucks and their size but the routing, control and maintenance of the vehicle. The man to handle this work will of necessity be a qualified transportation engineer of sufficiently broad business experience to thoroughly grasp the needs of the plant under consideration. Not only must he accurately gage the type of equipment and the number of trucks of each capacity but also their performance characteristics as determined by engine size, wheel size, gear ratio, etc.

One of the most interesting talks of the entire session was that of J. C. Thorpe, a graduate engineer who has been an automobile dealer for several years and lately a tractor dealer. His views on the ethics of salesmanship and the obligations of the factory to the ultimate consumer have been voiced on previous occasions. He summed up his views of the dealer in the following words: "The only man who has a right to be a dealer is the man who sells good merchandise by good merchandising methods and who, having made the sale, remains in the capacity of a consulting expert on the use of the goods."

There has been considerable discussion on who is the best qualified man to be a tractor dealer. Thorpe gave it as his opinion that the best tractor dealer, regardless of whether he formerly sold automobiles, hardware or farm implements, is the man who keeps his tractors sold. The manufacturer should, he said, study the interest of the purchaser through the dealer. He must do it through the dealer because of the proximity of the dealer and his acquaintance with the purchaser. In doing this the manufacturer gradually develops his good will.

It takes years of effort to develop the desired degree of public good will and it may be destroyed entirely by one bad step. As an example of the method necessary for the manufacturer to develop this good Thorpe cited the policy employed by Marshall Field & Co., which is embodied in the expression, "The customer is always right."

In many instances the farmer buys a tractor by selecting the dealer rather than the machine. This, he said, should not be so. The matter of service, of course, enters into the relations between the tractor dealer and his customers to a marked degree, but it must be remembered that there is no such thing as free service. Some one must pay and it must be the customer unless the dealer is to go out of business. We must reach a definite understanding of the meaning of the word service and we will not do so until there is proper co-ordination between the engineering and merchandising departments of our factories. Good service is the result of co-operation between the dealer, factory and owner during the life of the machine to the end that the owner shall receive continuous use at reasonable cost.

Age of the tractor, Thorpe contended, makes no difference as regards the rendering of service. Neither should it make any difference whether the machine is in the hands of the original purchaser or not. In order for the dealer to give the proper quality of service he must be amply supplied with parts and the necessary technical knowledge to perform the repairs he is called upon to make. An incompetent dealer will discredit a good design and set at naught all the care and study given to the original design of the machine.

Mr. Thorpe stated that he did not look with favor on the practice of replacing parts at shipping and labor cost to the customer where these replacements are due to defective material, even though the ninety-day guarantee period had elapsed.

In discussing the faults of design common to tractors, Mr. Thorpe brought up the point that probably the most common defect is the absolute neglect of attention to the comfort of the operator. He said that it is absurd to expect an operator to sit with any comfort in a cast iron seat for 10 or 12 hours at a stretch. He pointed out the remarkable sales value in the tractor in which this point has been given attention. No one but the farmer can appreciate the courage necessary to get

up at 4 o'clock the morning after spending a 12-hour day in a seat upholstered only with black enamel.

Another feature of design which the speaker stated is overlooked is that of supplementary tools. He stated that because the tractor is considered only as a plowing machine by a large percentage of operators the average use is only 35 days per year. Proper supplementary tools would make the tractor available for many more tasks and for longer periods during the year, bringing the average up to 65 to 70 days. This would spread the overhead and reduce the operating expense, making the tractor appeal to the farmer as a better investment than it does to-day.

One point which the speaker brought out is applicable to the truck dealer as well as to the tractor dealer. The data the dealer has available should be interpreted to the prospect in terms of his problems. He said there is a woeful lack of the right kind of data. Where tests have been made they are of a highly technical character and the results have seldom been expressed in such a way that the customer can apply the information to his own particular problems.

T. F. Cullen spoke on the need for greater service accessibility in car design. He made the point that greater accessibility for service work also tends to lengthen the life of a car, as it makes service work easier to perform, less costly and therefore more likely to be undertaken at the first indication of trouble. He said the supply of skilled mechanics is never large enough to fill the demand. Any improvement, such as better service accessibility, which cuts down the time per operation in service work without impairing the car's subsequent efficiency, has exactly the same effect as increasing the number of skilled mechanics. With more accessible cars, service stations can turn out more work with fewer mechanics and therefore make bigger profits, or show a profit where they now show a loss, as many of them do. The dealer's success, both in selling cars and in servicing them, is just as essential to the factory as the owner's satisfaction.

More and more cars are sold each succeeding year to replace worn-out vehicles. Service reputation, based on the cars now in use, is rapidly becoming the predominating factor in these resales. Therefore anything that can be done to improve service work will make resales easier.

As an example of the results which could be secured by improving service accessibility, it is only necessary to recall that there are over 8,000,000 cars in use to-day, and improved design which would reduce the time necessary for service work to the extent of only 2 hr. per car per year, would save the owners over $15,000,000 per year on upkeep.

The paper by Louis L. Scott, chief engineer of the Standard Engineering Co., St. Louis, on the application of steam power to an automotive truck, will be reviewed in a later issue.

Tax on Automobiles Is a Tax on a Utility

THERE still remains in the public mind a vague belief that the passenger automobile can truthfully be called a "pleasure" car—in other words, that it is to a large extent a luxury. There even remains the feeling that the automotive truck is an expensive form of transportation and should be discouraged. These beliefs, erroneous as they are, have had a decided effect upon the sentiments both of bankers and of the buying public. Those sentiments are responsible for the effort now being urged before Congress to impose greatly increased taxes upon both cars and trucks.

It seems impossible that any policy so suicidal to the prosperity of the whole country as well as one so unjust to a great industry can be adopted. It is surprising that any argument is necessary in regard to the truck. The Government itself has records showing that the postal express lines running over distances up to 248 miles from Maryland into Washington resulted in selling farm products to consumers at something like 43 per cent less than the normal market prices. Other statistics show that truck haulage can often produce a saving over rail transportation up to distances around 200 miles. The advantages of truck transportation for shorter distances, especially in cities, have been proved by hundreds of thousands of truck owners. Even a slight investigation would show these services conclusively.

The fact that the passenger car is a factor of equal economic importance is not so easily demonstrated by statistics and this perhaps accounts for the feeling that the passenger car is a luxury, although the car passed out of that condition at least six years ago. A recent questionnaire sent out by the National Automobile Chamber of Commerce showed that 90 per cent of all passenger cars are used more or less for business purposes, and that more than two-thirds of the total mileage run by passenger cars is for business. So the utmost that can be charged against the passenger car to-day is that it gives pleasure after it has done a full day's work. The questionnaire brought out an even more startling fact that the average motor car owner increases his earning capacity about 57 per cent through its use. The value to the farmer has been shown time and again, and altogether no doubt can remain in the mind of any candid man who investigates that the automobile is far more than paying its own way to-day. In addition, of course, are the great intangible values that the automobile is giving—its contribution to comfort, pleasure and health.—From J. G. Vincent's address at Annual S. A. E. Meeting.

Airplane Taxi Fares

AN aerial taxicab in London costs approximately the same as an earthbound taxi in New York, according to Prof. E. P. Warner of the Massachusetts Institute of Technology and the National Advisory Committee for Aeronautics, in his paper, "Commercial Aviation in Europe," read before the Commercial Aviation Session of the Annual Meeting of the Society of Automotive Engineers.

The charge in England for an aerial taxi is 2s. 6d., or 44 cents for two persons per mile. This fare is only two and one-half times as large as that for an ordinary taxi in London, and it costs approximately the same amount to travel by airplane in England as by taxicab in New York. The actual costs of air travel in Europe have shown a tendency to steady reduction.

During the first eleven months of commercial flying between England and the Continent there was a total of twenty-four accidents, but only one passenger was killed. This works out roughly as one death for every 67,000 passengers, or one fatality for 1,640,000 passenger miles.

No European country operates its own mail planes, as has been the practice here. The mail operating companies are privately conducted and receive a fixed fee from the government.

Vauxhall Producing Two Chassis Types

That for general purposes has 130 in. wheelbase and a 3¾ x 5½ engine. The sporting type has 114 in. wheelbase but uses a larger engine, is lighter and has a higher gear ratio.

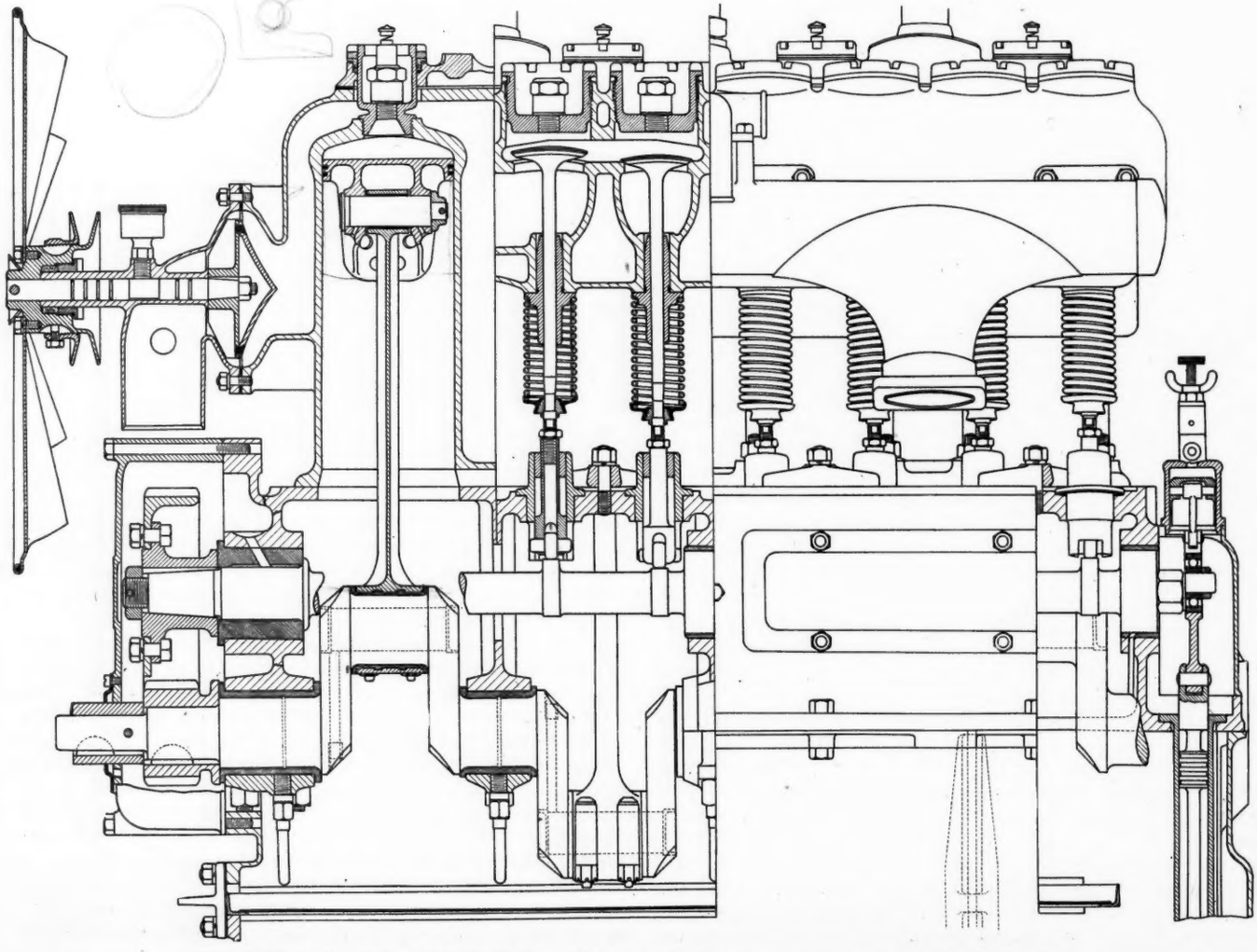
By M. W. Bourdon

TWO types of Vauxhall cars are to be made this season, as in past years. The smaller, termed the 25 hp. model, has a bore of 95 mm. and a stroke of 140 mm. (3¾ x 5½ in.). The block cast cylinders have L heads with the valves considerably inclined from the vertical. The cast iron pistons carry three rings and have the wrist pins fixed in their bosses. Pressure lubrication is employed. Oil is forced through the hollow crankshaft by a plunger pump operated from an eccentric pin at the rear end of the camshaft through a link having a ball-bearing on the pin. An upward extending link or connecting rod operates the piston of an air pump for the pressure feed fuel system.

Water circulation is of the assisted thermosyphon type, the belt driven fan shaft having at its rear end the impeller of a water accelerator enclosed at the front of the cylinder block. Magneto ignition is standard, the magneto being driven directly from the chain distribution on the left of the crankcase. The carbureter, located on the right, is bolted to an induction branch integral with the cylinder block on that side and leading by cored passages to the valve ports on the left, where the separate exhaust manifold is located.

A feature of both Vauxhall engines is the filter tray of gauze, which forms a false bottom to the crankcase, and can be withdrawn from the front below the cross member by removing the six nuts which hold the flanged front end to the front face of the oil sump.

Engine and gear-box are separately mounted on a subframe. The multi-disk clutch is connected to the four-speed gear-set by a shaft and flexible coupling. Right-hand control is employed and to the transmission is fitted



Vauxhall engine, 3⅞ x 5⅞ 30-98 hp. Note spark plug in cups over center of cylinder bore

an expanding type brake. An open propeller shaft, with star and block joints at front and rear ends respectively, conveys the drive to the spiral bevel gearing with 3.6 to 1 ratio in the rear back axle. Semi-elliptic springs are used, but the torque and drive are taken by a triangulated tubular torque member attached to the axle casing center at the rear and to a tubular cross member at the front. This chassis, which has a wheelbase of 130 in., has recently been reduced in price to $5,000, a reduction of approximately $1,000.

The second Vauxhall chassis is termed 30-98 hp. and has a bore and stroke of 3⅞ x 5⅞ in. As with the 25 hp., the four cylinders are block cast with L heads, but a distinct variation occurs in the position of the spark plug, which is mounted immediately over the center of the cylinder bore in a recessed cap, passing through a cored hole in the cylinder jacket and cylinder head. High lift cams with valves of 2¼ in. diameter, stiffer springs and slipper type aluminum pistons with two rings are other features wherein the larger model differs from the other. It has a five-bearing hollow crankshaft arranged for pressure lubrication, with the same type of oil and air pumps as in the case of the 25 hp. model.

There is very little difference, except in the points mentioned, between the two chassis in general construction, though the larger one has a shorter wheelbase (114 in. as against 130 in.) and straight bevel final drive instead of the spiral bevel. This chassis is also considerably lighter than the other, viz., 2650 lb. as compared with 2900 lb.; naturally, then, it has a higher gear ratio, viz., 3 to 1. It is made primarily for light sporting type four-passenger bodies and not for general purposes, as is the 25 hp. chassis. The sporting type shown at Olympia was fitted with a body of the clover leaf pattern seating three passengers and having a very light superstructure.

This chassis has also been subject to a price reduction of approximately $1,000, now being sold at $6,250.

Valuable Work Done by the Forest Products Laboratory

ORGANIZED research to-day is becoming more and more of a factor in progressive business. There is a decided advantage from the standpoint of the wood-using industries in having available a neutral research organization, such as the Forest Products Laboratory, which is not only the foremost of its kind in existence, but which is well organized, efficiently operated, equipped already with a large knowledge of the basic properties of wood, and with facilities for advancing research economically.

The laboratory's activities have touched practically all wood-using industries and have advanced in one way or another their knowledge of wood and their methods of using it. Every thousand feet of lumber (88 1/3 cu. ft.) made available through better utilization relieves the drain upon the forest by about 250 cu. ft. This is because under present utilization three cubic feet of wood must be grown in the forest for each cubic foot of finished lumber.

The work of the laboratory is concentrated upon devising means for saving as many of these cubic feet as possible, and upon securing the adoption of the improved methods by the industries. Almost invariably, the methods which have been developed have resulted, not only in an actual saving of wood, but also in a better or cheaper product delivered to the consumer.

Very definite progress has been made by the laboratory along many lines of conservation and utilization, and also along other lines, such as in the development of water-resistant glues.

The function of the Forest Products Laboratory is, in the main, two-fold—first, to carry on research and obtain authoritative information concerning wood and other forest products, and second, to make this information available, in usable form, to the industries and to the general public.

During the ten years of its existence the laboratory has made much progress in connection with items listed below. Aircraft parts boxing, crating, packing, chemistry of wood, decay and decay prevention, ethyl alcohol from wood waste, glues for wood, grading lumber, grading structural timbers, hardwood and softwood distillation, identification of wood, kiln drying and air seasoning, mechanical properties of wood, structure of wood, needle and leaf oils, preservation of wood, pulp and paper, steam bending, veneers and plywood, wood finishes.

As illustrations of the kind of work carried out at the laboratory, a few typical accomplishments are presented here.

1. The art of testing containers has been developed at the laboratory in the past five years. During that period much has been discovered concerning the proper construction of boxes and help has been given to various associations and to many individual manufacturers and users of boxes in the most efficient and economical methods of design and construction. Much progress has also been made in the design of crates for machinery. To make the knowledge gained more effective, and in response to insistent demands from box makers, packers, and shippers, courses of instruction in box and crate design are given periodically at the laboratory.

2. The experiments conducted at the laboratory during the past nine years have developed kiln drying from a haphazard, wasteful and thoroughly unsatisfactory rule-of-thumb process to a reasonably precise art. Methods and drying schedules have been developed for the drying of most commercial woods, ranging from oak vehicle stock, green from the saw, to one-inch pine and fir. Numerous patents have been taken out on apparatus for artificial seasoning, and two types of dry kiln have been developed to a state of high efficiency.

The most spectacular, and also the most urgent, applications of this drying work were the drying of gun-stocks, artillery stock, and airplane stock during the war. This was done with thorough success in many kilns of the type developed at the laboratory, and according to specifications and schedules prepared by the laboratory. Courses of instruction in kiln drying are given each month and are proving of great help to the industry.

3. Search for substitute woods to replace the rapidly vanishing spruce and other commonly used pulpwoods has been going on steadily for many years.

4. All the important American woods, in commercial use, have been tested and their mechanical properties determined, and made available to the industries.

5. Investigations into the efficiency of many wood preservatives and into the best way to impregnate the important commercial woods of the United States have done much to advance the art of wood preservation.

Editorial on Doubling Fuel Mileage Commended by Prominent Engineers

Effort to arouse automotive industry to need and possibilities of greatly increasing miles per gallon of fuel meets with favorable response. Some conservative engineers consider radical changes desirable.

THE editorial bearing the title, Can We Double Mileage Per Gallon of Fuel? which appeared in AUTOMOTIVE INDUSTRIES for Jan. 27, has resulted in comment which indicates that many engineers agree with the view that it is possible to greatly increase the number of miles per gallon that cars travel under present conditions, and some of them state that radical changes must be made. While nearly all the comment received indicates that the basic cause of inefficiency of present day engines as now applied is recognized and must, as we pointed out, be remedied before very material increase in efficiency can be attained, there is naturally much difference of opinion as to the methods by which the desired result can best be attained. Some consider rather radical changes desirable while others point to lack of refinement in the average present day engine as the first problem to be attacked. Some doubt the possibility of attaining double the mileage now secured, at least in the case of cars which are now performing well above the average, but others think such an increase within the realm of possibilities.

Some of the comment we have received deals, primarily, with the methods we mentioned as being promising, one or two taking the view that the evidence to date in favor of these methods is not sufficient to justify a prediction of their general application. Our intention is not, of course, to "boost" any one method of securing the desired result, and we have tried to make it clear that much careful research is necessary before any method can hope to see general adoption. Our purpose was, first, to point out the inherent defects in present practice; second, to show that there are possibilities of material improvement, and third, to urge upon those in a position to develop these possibilities the importance of supporting and prosecuting research which will enable the industry to realize the benefits which are within its reach.

We propose to follow out this policy and give space to descriptions of any methods which seem to us to promise the desired results, as well as to reports of research work and constructive comment which lead in this direction. It is our intention to hammer away at the fuel problem until concrete results are attained, or at least until it becomes evident that such results are not attainable or that the automotive industry is too little interested to make the effort worth while. We bespeak the co-operation of those who we know have this matter at heart, but will, of course, welcome constructive criticism.

The following extracts from letters referring to the above-mentioned editorial will, we believe, prove interesting and instructive. They represent only a fraction of the total number of comments received.—THE EDITOR.

Andrew L. Riker.—I am heartily in accord with the editorial which appeared in AUTOMOTIVE INDUSTRIES of Jan. 27, as I believe that something must be done to make the automobile engine more efficient. I have had this in mind for some years past, having designed an engine some 18 years ago, operating on constant pressure cycles, as against the constant volume cycle, and cannot help but feel that we must abandon our old ideas and secure a new system of using fuel, which will permit us to have at least a fair efficiency on part load, as that is about the condition we are operating under practically 90 per cent of the time.

Harry L. Horning.—Accept my thanks and compliments for the very well-put editorial in your issue of the 27th. It certainly hits the nail on the head.

Percival S. Tice.—I have found your editorial of very great interest.

We have been working with a method of localized carburetion, which has given some very interesting results. At the same time it seems to be proven that the full advantage in economy of this method of supplying an engine with charge, cannot be realized unless the compression ratio is carried quite high—that is to say, so high as to be practically unusable in the ordinary class of automotive equipment.

It must be granted that there are very material improvements in thermal efficiency at small loads when full charges of air are taken into the cylinder under all conditions of load, but it must not be overlooked that to a very great extent the improvement in efficiency under small load conditions follows from the great reduction in charge dilution in such an engine, rather than from the increased compression pressure. In the ordinary engine, operating at about one-tenth load the charge dilution amounts to approximately 60 per cent by weight, while when full quantity of air is pumped the dilution will run from 4 to 6 per cent.

It is the writer's opinion that a more flexible and generally usable engine would result with localized fuel charges if it should be found possible to obviate this excessive dilution with products of previous combustion, and at the same time not very materially alter the compression pressures now obtaining over the load range.

A. L. Nelson.—I was very glad indeed to see the editorial comment on doubling the mileage per gallon on fuel which is published in the Jan. 27 issue.

I believe that the editorial is along the right line and that it is very commendable to urge engineers on at the

present time in order that they put forth their best efforts to produce engines and cars which will give us a much better efficiency than we are getting to-day.

It is also very apparent that we have to make more than an ordinary change in the present time equipment used, and it is surprising the many schemes which appear very feasible that are available when one looks at the problem with a view of seeing what can be done. I might add that we are making some analyses now which appear to offer perhaps 100 per cent increase in mileage without departing very far from standard construction of to-day.

I wish to personally thank you for the efforts you are making to get the problem before the engineers in the industry.

C. A. Norman.—I was very glad to read the editorial on improved fuel economy in AUTOMOTIVE INDUSTRIES for Jan. 27. It is certainly highly commendable for you to take this matter up and urge its careful consideration on engineers and manufacturers.

It may perhaps be of some interest to point out that the improvement attained (in the type of engine described) would not appear to be due simply to increased compression pressure at reduced load. The compression pressure in the Diesel engine remains constant at all loads, yet the thermal efficiency is actually improved at reduced load, on account of decreased "admission," meaning increased expansion. The improvement due to increased compression pressure is caused directly by the smaller amount of residue remaining to foul the charge and impair ignition; by the lower end temperature of compression due to less heat by the residue and consequent greater temperature and pressure ratio available from combustion; by the reduced cooling losses due to possible lower temperatures with leaner mixtures; finally, and perhaps mainly, by the possibility of securing good ignition with sufficiently high air ratio for complete combustion of the fuel.

I have been trying to discuss all these matters a little more thoroughly in a bulletin of the University Experiment Station, which also will contain my entropy chart. Very naturally, you could not enter upon all these things in an editorial without losing something in force of the main point to be driven home. Nevertheless, in engineering discussions I think that it may be of some value to set forth the detail function of expansion and compression separately in their influence on fuel utilization.

H. C. Dickinson.—The possibilities in the line of designing more efficient automobiles and power systems are almost unlimited. There is probably no question whatever that we could, and probably will, design automobiles capable of giving two or three, or possibly four times the mileage of present designs without any appreciable sacrifice in comfort, convenience or speed. The main possibilities along this line would seem to be: (1) Improvement of the fundamental economy of the power plant; (2) Development of a suitable transmission system which will enable the power plant to operate always at an economical speed and load; (3) Design of vehicles to permit much lighter weight without sacrificing speed and comfort.

Whatever may be the possibilities of improving car design with a view to economy, or even the possibilities of modifying existing engines to improve economy, the fact remains that there are at present in existence some eight to ten million motor vehicles, that these vehicles will be in service for an average of perhaps four years, that they are going to be operated and supplied with fuel as long as fuel is available at any price less than say double the present price, that no substantial modifications are going to be made in the vast majority of these vehicles. If the foregoing statements are true, the existing vehicles alone are destined to consume, before they are worn out, a very large part of all the motor fuel which will be produced from United States petroleum. I believe that the Geological Survey has estimated that the crude oil left in the ground would last about twelve years at the present rate of consumption. If this is the case, the existing cars running for four years would consume about 30 per cent of the total gasoline available from this crude oil by present methods of refining. It might be of interest to make a more definite estimate of this figure. In view of these facts, even if not a single additional uneconomical vehicle were constructed, the problem of fuel conservation in existing vehicles would be of paramount importance. As a matter of fact, millions of additional vehicles will be built substantially on present designs. There is no question, therefore, that the most immediate results in the way of fuel conservation can be secured through improvement in the fuel economy of existing equipment, without the addition of any complicated or expensive devices.

The figures given by the Bureau of Mines, indicating that 25 per cent of the fuel used is not even burned, are probably conservative. Moreover, probably much more than a 25 per cent increase in mileage of the average vehicle could be secured by careful operation alone. Almost any engineer or skilled mechanic can secure a large increase in the mileage of the average vehicle without any sacrifice in performance, and we can no longer afford to dismiss the fact with the simple statement that the fault is all due to the ignorance and carelessness of the average driver. The ten million drivers in this country are average people with average intelligence and are interested in saving fuel. If a saving of 25 per cent to 40 per cent of the fuel bill is as simple as it seems to be in the hands of the engineer, there certainly is a possibility of educating a considerable percentage of these ten million drivers so that they can secure such saving. Is it not worth while for the engineer to first determine precisely how the average driver can improve his mileage and then to proceed to educate the average driver to a point where he can secure this result?

Henry M. Crane.—Of course what you say regarding the necessity of maintaining the highest possible compression at the actual running speeds is absolutely true, and it is equally true that this is a condition almost impossible to obtain in the ordinary type of four-cycle engine. There is evidently, therefore, a possibility of very radical improvement in road mileage per gallon by changing the type of engine. No engineer has the right to overlook this possibility. On the other hand, we know that very many cars to-day are being put on the market that would be capable of great improvement in mileage if better design and also better workmanship were used in their construction. I think that the industry as a whole is very lax in its attitude toward such improvement and would like to feel that there is no use of doing much except wait for some revolutionary invention to come along.

I know you say that work should not cease on the development of the present conventional designs, but I am discussing the effect that the general tone of the article had on me and would be sure to have on the men in the industry who are not engineers.

Hugo C. Gibson.—The editorial in AUTOMOTIVE INDUSTRIES is very interesting. I believe that you can do no better service to the automotive industry than to harp and harp along these lines until the manufacturers are

forced into a position of attacking this problem wholeheartedly.

We are going right after it, hard. Of course, we have a strong incentive in the absolute necessity for furnishing the public with a quiet engine, and I believe that quietness of operation and economy go very much hand in hand. I never heard of a detonation that was either quiet or economical.

Th present tendency of the automotive industry, practically throughout the world, toward the small high-speed engine is, in my opinion, only justified by such economy as is represented in the low first cost of the apparatus. We all know that the Otto-cycle automotive engine is most economical in consumption at moderate speed—say from 900 to 1400, averaging perhaps 1100 r.p.m.—and that a really serious increase of cost of operation, not only of fuel and oil but a great depreciation of every operative part in the power line, occurs just so soon as we increase the rotative speed of the engine.

European practice is tending more and more toward the use of an increased number of selectable gear ratios which, providing the engine is large enough to permit its use at the economical speed of rotation, is a real step toward economy. This leads us to the question as to whether a four-speed gear driving direct on third, with stepped up fourth or direct on fourth, would be the most desirable. Personally I believe in the direct on third.

It is a fact that no high-speed machinery is quiet, and that noise means wear—even the high-speed electric motor is not quiet and it surely does wear in comparison with low speed. Friction horsepower curves show us clearly enough that the amount of gasoline used up in turning the small engine over at a high speed, apart from the amount used to deliver turning effort to the rear wheels of the car, is not in any sense compensated for by the slightly less effort required to propel a similar car, but fitted with a few more pounds weight in the engine.

Taking all the above into consideration, you can see why I am in favor of an engine large enough to furnish a reasonable touring speed at an economical r.p.m.

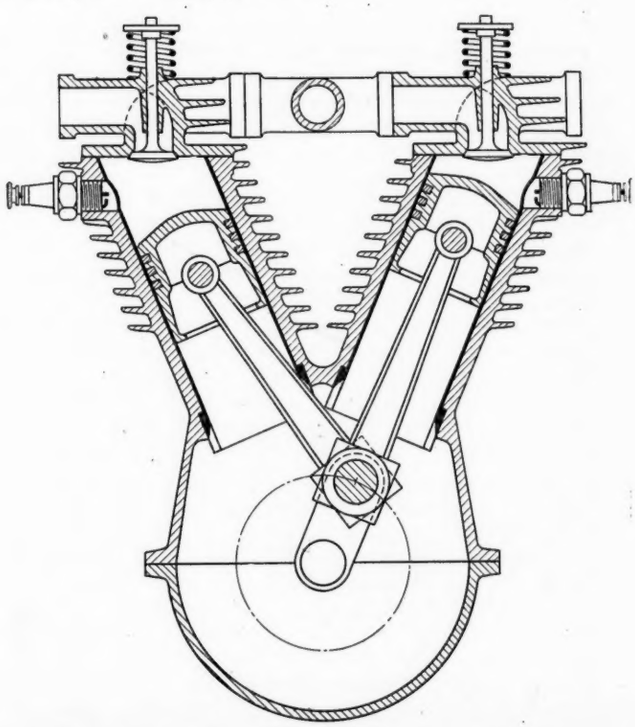
I believe with you that it is time for radical improvement and it is possible that this improvement may lie in raising the physical duty per piston—in other words, making a smaller boiler do the same work at the same speed of operation.

Otto M. Burkhardt.—I am very much interested in the editorial in AUTOMOTIVE INDUSTRIES of Jan. 27, 1921. In this it is stated that a prominent manufacturer has increased the fuel efficiency by admitting pure air through one of the dual inlet valves and a rich mixture through the other. In consequence the full compression pressure is claimed to be maintained regardless of load. This is truly an ideal, engineers have been hoping to materialize. The most reliable experiments in this direction of which I have knowledge are those by H. R. Ricardo compiled in a paper that was read before the Royal Aeronautical Society of Great Britain. This paper was published very recently in the English paper *Engineering*. Ricardo's success was not nearly as marked as stated in the editorial mentioned above, and what is more important Ricardo's success in saving fuel entirely depended on his success of keeping the mixture in strata.

Stratification of the charge it must be admitted in one way conflicts with high efficiency because strata preclude turbulence and turbulence as we know is all important to secure reasonably fast combustion. There are, of course, other difficulties such as uneven distribution of the charge in a long manifold. This condition is accentuated if only one part of the cylinder charge is taken through the carbureter.

An Aluminum Motorcycle Engine

A NEW type of motorcycle engine, which should be very light in weight, is described in *The Motorwagen*. It is of the 2-cylinder "V" type, and the two cylinders are cast together with the top half of the crankcase of aluminum. Cylinder liners of cast iron are set into the mold, and therefore do not have to be fitted. The cylinder heads are separate castings, and the upper surfaces of the cylinders are parallel with the lower surface of the upper half of the crankcase, hence both surfaces can be machined in a single operation. Making the cylinder heads separate obviates the necessity for valve cages. It appears to be the intention to use a ground joint for the cylinder heads, and no gaskets. The valves are arranged perpendicular to the cylinder head joints. The carburetor can be conveniently attached to a short, straight length of pipe between the two cylinder heads. Aside from the inclined cylinder bores, an arrangement which, of course, cannot be avoided, in a V type motor, all inclined surfaces have been eliminated, so that a casting can be machined on any suitable tool without special fixtures. Even the bosses for the spark plugs are arranged horizontally. In small engines the location of the spark plug bosses usually causes the designer considerable difficulty, but the problem has here been solved in a rather skilful manner.



Motorcycle engine with cylinders and upper half of crankcase cast in one piece

ACCORDING to G. C. Loening, the world war hindered rather than helped the development of commercial aviation, due to the fact that many interested in aeronautics have learned to think in terms of war machines rather than of types better suited to commercial work.

Cast Aluminum Instrument Boards in Wider Use

Are applied to most high-priced chassis of British and Continental make and, in simplified construction, to cars of moderate price. The all-metal board is smart in appearance and very workmanlike in arrangement.

By M. W. Bourdon

THE practice of using cast aluminum for dashboards and instrument boards, which first became pronounced at the Paris Salon of 1919, is spreading appreciably on European cars, and this form of construction appeared at the London show on cars of quite low power and on others of medium price, as well as on the high-grade jobs. Cast aluminum unquestionably makes a more workmanlike arrangement, though objections are raised against it in that when sand-blasted it shows up dirty finger marks very prominently, and when polished it forms another item to keep clean if its smart appearance is to be maintained. A smooth but dull finish would seem to be the best.

A simple form is shown in Fig. 1, the Vermorel, but here the dashboard itself is of wood with two latticed brackets of channel section carrying the separate aluminum instrument board and continued below to support the sloping front footboard. It will be noticed that a bracket extending from the right hand side serves as an additional support for the steering column, an unusual feature, but one which might with advantage be more widely adopted, for steering columns on many cars of all nationalities are prone to vibrate appreciably.

A more substantial construction is that of the Star, made by a firm usually inclined to be very conservative and one of the last it was imagined would adopt such an up-to-date construction. The photograph (Fig. 2) is almost self-explanatory, the only feature worthy of special mention being the pivoting of the throttle pedal on the aluminum "ramp" (sloping floorboard). The pedal consists of a curved plate with a tongue projecting down through a slot in the "board," the bottom end of this tongue abutting the flat surface of a lever linked to the carbureter and secured independently of the board. Thus the latter can be lifted clear with the pedal without breaking any joint in the throttle connections. The dashboard is separate from the ramp brackets, its foot being bolted to the top of the latter.

Another fairly simple construction is the D.F.P. (Fig. 3), but this does not give the idea of stability which should be a feature of cast aluminum boards; the dashboard, for instance, needs support from the cowl paneling, whereas, obviously, the reverse condition should apply. The Charron Laycock arrangement (Fig. 4) is far better in this respect, for the dashboard is a box-like casting with its rear face brought well back to cover the ramp. This car is one of quite small dimensions. It has a four-cylinder engine of but 2 9/16 x 4 5/16 in. and sell at $3,000 with a two-seated body.

The Brasier design (Figs. 5 and 6) is also of box form, but this differs considerably in that the space between instrument board and dashboard is enclosed below, the parts and wiring within being accessible, when the cowl has been fitted, only by removing the panels of the dashboard. This is an unnecessarily involved arrangement, as one of the illustrations makes clear. It consists of a number of separate castings with detachable panels and filling-in pieces of specially shaped sheet.

The Straker-Squire construction is unique. As seen in Fig. 7, the unit cast dashboard and ramp support the instrument board by a tubular cast bracket, which contains all the wires and other connections to the instruments. The Klaxon horn is so placed that the passenger's feet may cause damage to the terminals, and where it is somewhat inaccessible when adjustment is required—points which should not be overlooked if this location is selected.

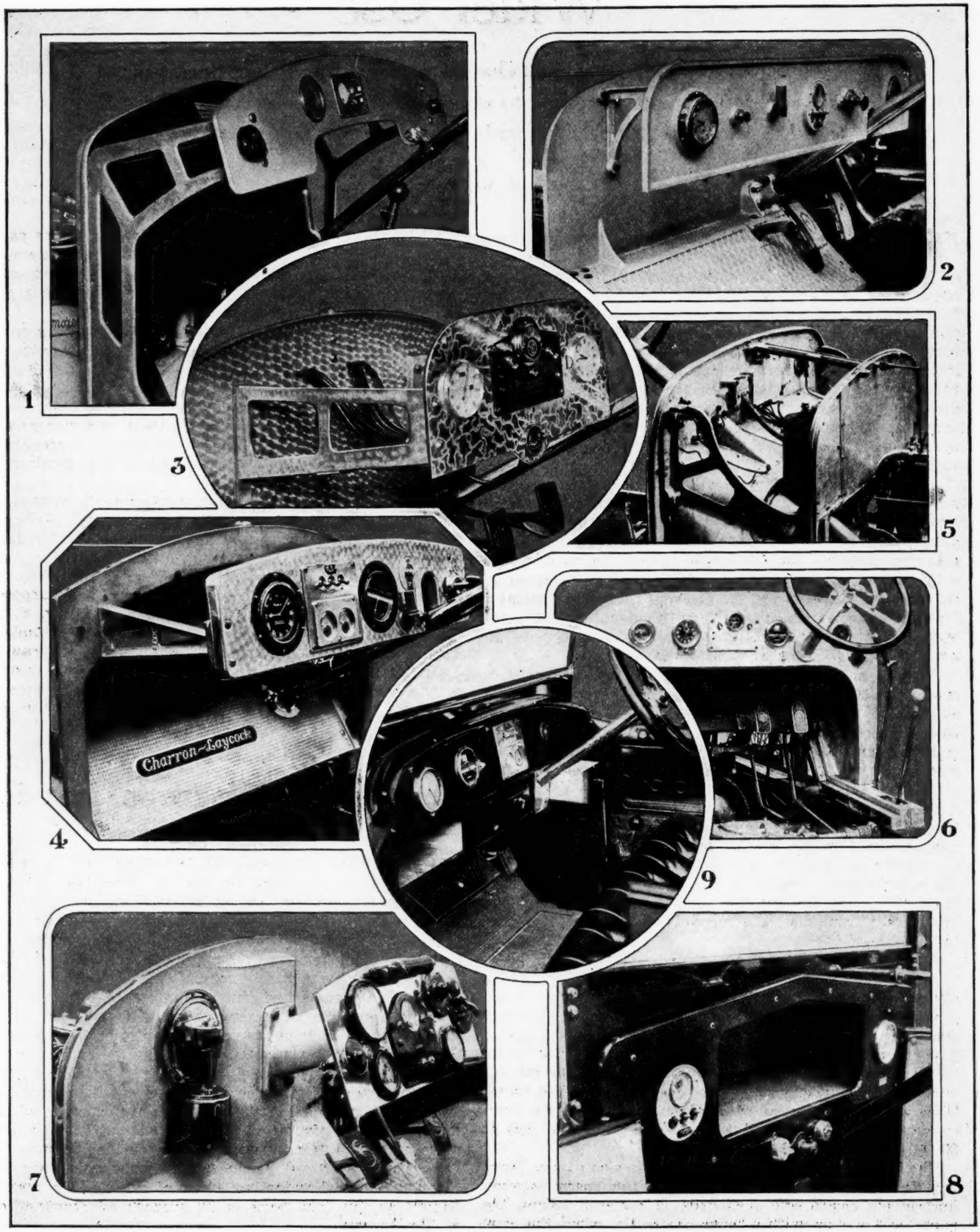
But by no means have the majority of British car manufacturers adopted the aluminum construction. Wolseley, for example, has an instrument board of polished mahogany depending from the cowl but, although the fuel tank is carried at the rear, no attempt is made to utilize the space in front thus made available for other purposes. Standard cars have a roomy enclosed shelf (Fig. 8) at the center for small parcels, gloves, etc., while Humbers (Fig. 9) provide a deep cupboard and a couple of drawers 14 in. long, all these finding space under the actual instrument board and in no way incommoding the occupants of the front seat—they are a distinct advantage and might well be used whenever space for them is available.

Developing a Magnetic Test for Twist Drills

THE Bureau of Standards is taking part in a co-operative investigation by a committee of the American Society for Testing Materials on the testing of twist drills by magnetic analysis. The steel has been specially prepared by one member of the committee and tested for homogeneity by a magnetic method at the Bureau. The drills are to be manufactured from this steel by another member of the committee under carefully controlled conditions, after which they will be tested again magnetically by various members of the committee. Following the magnetic tests, the drills will be returned to the manufacturer, who is to give them a thorough mechanical test. The committee will then meet and atttempt to correlate the mechanical performance of the drills with the results of the magnetic tests. The ultimate object of this investigation is the development of apparatus which can be used in a commercial way for the non-destructive testing of twist drills. The special apparatus for this work is in process of construction at the Bureau.

Types of Instrument Boards Used on British Chassis

(Note extensive use of cast aluminum)



Mechanical Requirements for Trailer Progress

The use of trailers began long before the development of the motor truck; railway trains utilize the principle. Certain mechanical changes are necessary, however, for the progressive development of the trailer in connection with motor driven vehicles. This article discusses this important question.

By Marius C. Krarup

UNTIL twenty years ago nearly all loads in transportation work, on land, were hauled in vehicles trailing after the power unit, unless the loads were very small, the roads very rough and tortuous or primitive customs prevailed. Elephants, camels, llamas, burros, pack mules and saddle horses, all combined, did not figure big in tons or miles as against railway trains and the standard combinations of horses and wagons. Then came the automobile and the motor truck, with their high speeds, and temporarily broke up the trailing system for transportation on common roads, while the tractor continued it for the slowest forms of work only.

There never was any much better reason for abandoning the trailing system for fast work than technical or industrial difficulty in getting all features in transportation by engine power perfected at the same time and quickly enough for satisfying the public demand.

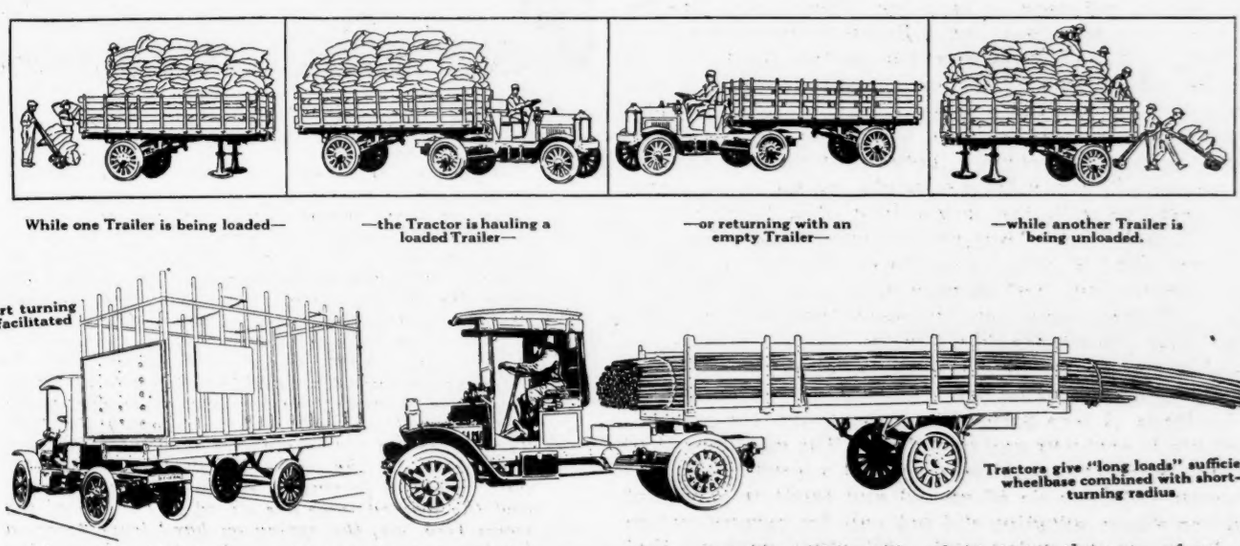
Motor trucks have come as an avalanche, rather than a development, as all can now see by looking backward over the last few years, and the almost abrupt transition to new methods would be more marvelous than anything that is real can be, if there were not many things in the use of trucks still to be adjusted to the great variety of working conditions. The orderly reintroduction of the trailer system, changed as much as necessary for reconciling it with the peculiarities of engine power, as well as modern production and marketing methods, is naturally among the first and most important steps toward improved adjustment to the realities, and has already been widely accepted as indispensable for strict and competitive economy in many lines of business.

Terminology of the Industry

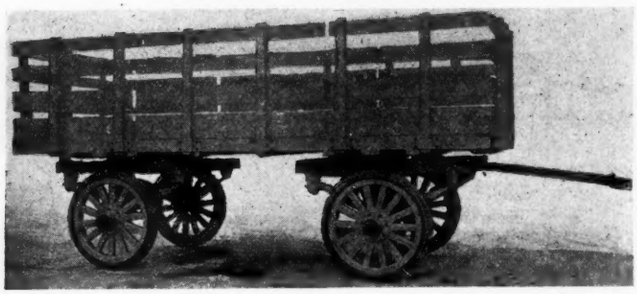
There are, perhaps, 50,000 trailers in use now in the United States, not counting railway cars or the working machines pulled by the tractors. The word "trailer" has, in fact, already become specialized in its sense, so as to refer particularly to separate structures intended for carrying loads in connection with automobiles, motor trucks or tractors. We speak of "four-wheeled trailers," "two-wheeled trailers," "semi-trailers" and "pole trailers." The phraseology is awkward as yet. Terms sounding more natural and businesslike may be found and adopted.

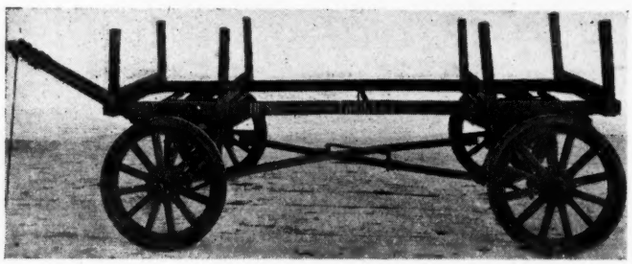
Such words as trailer, trailcart, loader or loadcart and pole-dolly or dolly—for designating the same types in the same order as before—might be found preferable. The word "dolly" is already widely used, though usually with a prefix indicating the purpose of its employment, as lumber-dolly, timber-dolly, pipe-dolly. The latter is used much in the oil regions.

The term "tractor-truck" is sometimes used to denote the shortened truck or light tractor used for hauling a semi-trailer. Traction-cab or cab would be more accu-


While one Trailer is being loaded—
—the Tractor is hauling a loaded Trailer—
—or returning with an empty Trailer—
—while another Trailer is being unloaded.
Short turning is facilitated
Tractors give "long loads" sufficient wheelbase combined with short-turning radius

(Above) Some operative advantages of the trailer system. (Below) Shows the short turn, the ease of maneuvering in tight places, and the suitability for long loads





(Above) Reversible four-wheel trailer made with two-wheel-and-axle assemblies turning on fifth-wheels under frame carrying body. In towing, the rear one is locked. In backing the front one may be locked. (Below) One manufacturer employs cross-connected axles and two fifth-wheels for a four-wheel trailer, which can be reversible

rate and handier. But in the following the current terms must generally be used.

Effect of Competition

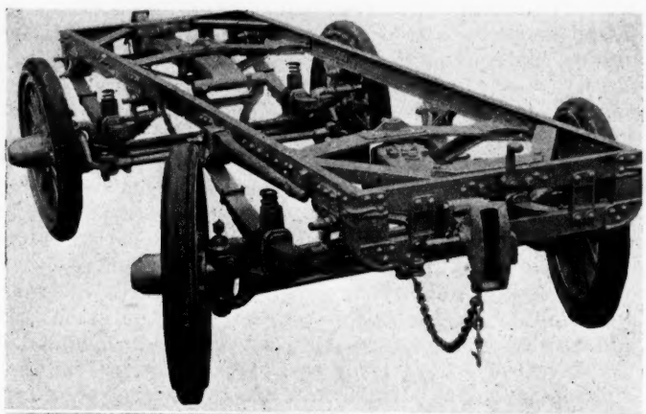
In order to perceive easily the reasons for special construction features in modern trailers it may be useful to note first the evident reasons for that temporary abandonment of the trailing system which has been witnessed. It was possible to give the motor truck a load capacity comparing fairly well with that of the draft truck. But it had no advantage on this point, and it became soon an article of faith that the merits of the motor truck were due to its speed, its capacity for sustained work and the extension of the business zone following the increased daily mileage.

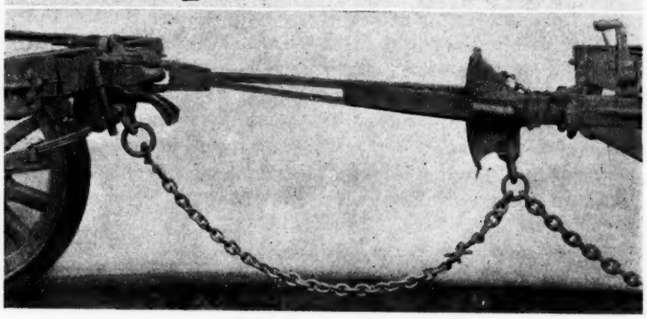
These advantages seemed sufficient so long as the motor truck competed mainly with its predecessor. We humans are modest in our demands if it is not evident that we can get more by insisting. Then there was the traction problem; tires and differential gears were imperfect, and too frequently the motor truck was in trouble taking care of its own propulsion. If it was found in practice that a certain large apparent surplus of engine power was required for the dependable operation of a truck, why would it not eventually be found that a corresponding and larger surplus would be required for operating with the larger load of a truck with a trailer? The answer was not at that time as clear as it is now. Furthermore, couplings suitable for motor truck speeds and short turning angles had not been devised. Neither could they be copied from railway practice, where short turns do not occur.

But in the course of a few years, when motor trucks became so common that they competed in the same lines of business, it was natural to look around for new advantages in economy and operation. The employment of trailers, when that point was reached, presented the conspicuous inducements of an old and familiar expedient and one whose adoption did not call for reconstruction of the expensive motor unit. All other methods that might be contemplated belonged in the realms of radical and dubious engineering—referring to such possibilities as are represented in the heavy steam lorries of England or the introduction of tractors for city commerce. They spelled heavy investments and postponed results. The rejuvenated trailer system, on the other hand, could be inaugurated by the owner and user of motor trucks at small initial expense, involved few delays and could be extended in the measure as it proved itself profitable.

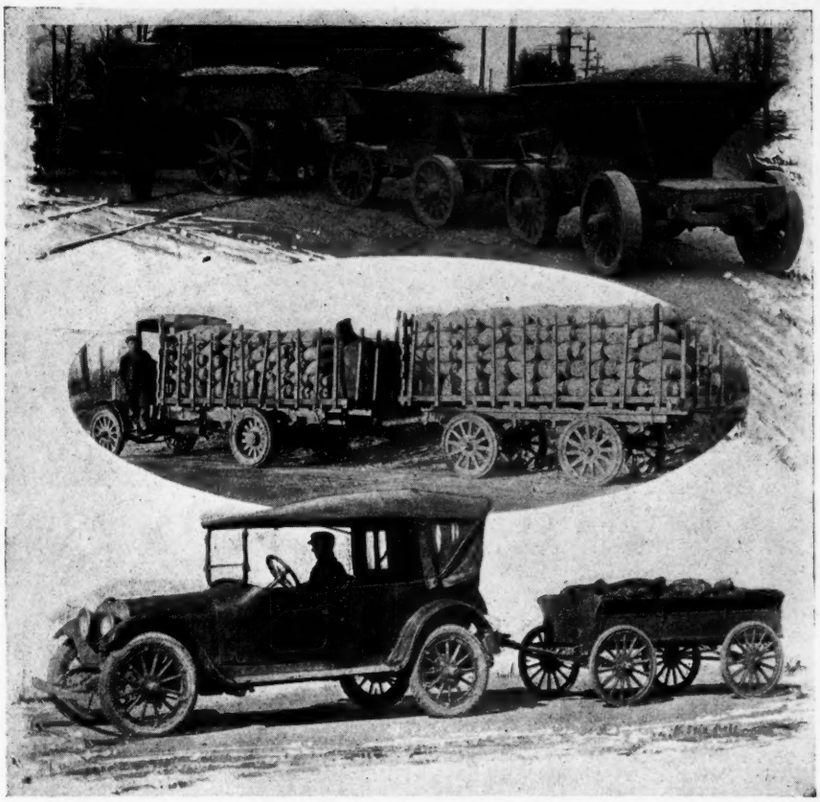
Operating and Upkeep Costs

The inception and rapid growth of the modernized trailer movement is therefore a natural upshot of conditions, logical and inevitable like every other materialistic movement that makes way for itself. The businessman no longer shows his enterprise and intelligence by adopting or resisting it, but by deciding in what particular form he can best make use of it. In some cases he may properly conclude to wait, but if he has a growing business with rush periods or seasons and the local roads are favorable, a trailer equipment of one type or another will usually save him operating and upkeep costs, even in those cases that seem most doubtful at first glance.





(Above) Typical four-wheel trailer chassis of reversible pattern, having hinged yoke at end of swiveled drawbar to compensate for spring action. The yoke is hinged to a horizontal yoke journaled at its rear end to center of transverse steering rod. Drawbar has a bumper head and encloses double-acting draft springs. A drawbar lock, to immobilize rear steering gear in turning or front gear in backing, is released by turning lock crank. To back, the bar at side of frame is inserted in rear drawbar and used as steering lever. (Below) Automatic hitch secured to motor unit in connection with chassis shown above. To couple, the operator raises hand lever and thereby parts the jaws. Then inserts connecting bar into guide and backs motor unit (truck or tractor), tripping the lock. The chains are for safety. To uncouple, the hand lever is raised, the chain unhooked and the motor unit is driven forward. When coupling is made, and the pivoted jaws are closed in the eye of the connecting bar, the spring on hand lever forces a lug between opposite ends of the jaws, securing the coupling till it is released by hand



This group represents three forms of standard practice for four-wheel trailers. (Upper) A loaded truck (designed on tractor lines) operates as tractor hauling two reversible trailers with dump bodies, having fixed axles and automobile steering linkage for each pair of wheels. (Oval) A clear case of the possibilities for surplus traction which the heavy loads on the truck's driving wheels affords. (Lower) Illustrates how the trailer system is applied to the domestic or industrial wants of farmers who own automobiles

The local roads need not be favorable if the goods handled are too bulky to make a full-weight load in the loading space of standard truck bodies. In the large majority of instances the economic issue is much clearer than it ever was between electric trucks and gasoline engine trucks. To decide it, one must know the facts—the facts of the business in question, of the motor trucks on hand or in the market, and of the trailer vehicles and methods.

Though it is generally said, or even admitted by trailer manufacturers, that trailers cannot be used very well for retail merchandise delivery, this implied restriction of the field seems too broad. Tricycle delivery carts operated on the semi-trailer principle have been employed successfully for many years, specially in Europe, antedating the heavy semi-trailers and escaping their name. And the side-car, which is also used for light delivery work, may be considered as a motor unit with a trailer at its side. The possibilities for light semi-trailers for this field of work seem to be wide open.

Adaptability to Requirements

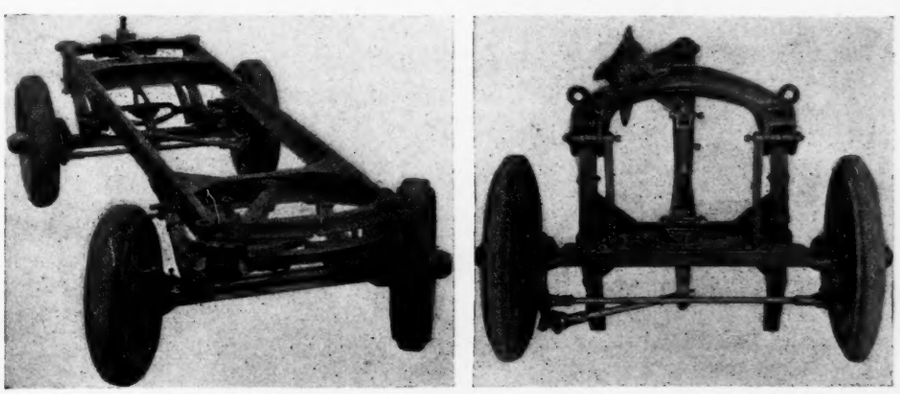
Perhaps the trailer system has been viewed too closely with reference to the improvement in load capacity which it offers in comparison with motor trucks alone. Trailers are based upon the fact, it is constantly said, that every motor truck, to be able to cope with emergencies, must be superpowered for its normal work, so that the idle surplus of motor and man power can and should be utilized for hauling additional loads whenever the working conditions are dependably normal, and particularly where road surfaces and grades are favorable. The same reasoning would argue for very large trucks with very small power, if other considerations were not active. But industrially and commercially only a limited number of motor types can be made and marketed, and the salable type is the superpowered truck having a large range of working capacity plus a margin for temporary or permanent deterioration.

The trailer system does more than fill the gaps between motor trucks of different types and sizes; it adds a flexibility in operation which the largest assortment of specialized motor trucks could not supply in practice and provides a way for taking care of loads of abnormal lengths, bulk or weight which are incompatible with transportation in normal motor truck bodies.

Motor trucks have done so well that this broad opportunity for the trailer system could be slighted for a while, but it is now accentuated wherever loading time and waiting time make inroads in the truck's working hours, and in the driver's. There it appears plainly what the indivisibility of the motor truck unit means economically in contrast with the great flexibility in operating methods which trailers introduce and render practicable. What chance, to mention a parallel case, would electric trucks have had if batteries and battery cells had not been removable and interchangeable?

Three Main Characteristics

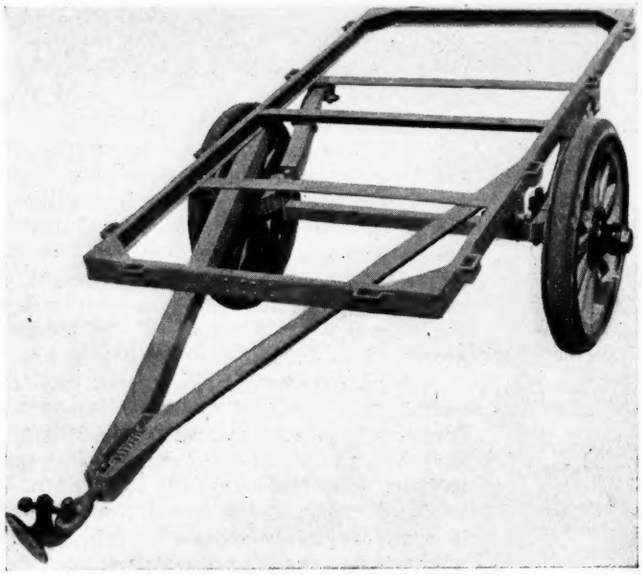
The trailer system is thus seen to be based on three principal characteristics. It is not based on the possibility of hauling a larger load by sailing closer to the



To the left—Another typical four-wheel trailer chassis. Outstanding features are the use of radius rods to safeguard the steering against being influenced by oscillations of the vehicle springs and a pivoted connection between drawhead and drawbar. This connection is utilized for backing but is ordinarily immobilized by a locking bolt. To the right—One end of chassis tipped to show details of steering gear from underneath. Drawhead is shown in pivoted connection with the locked drawbar

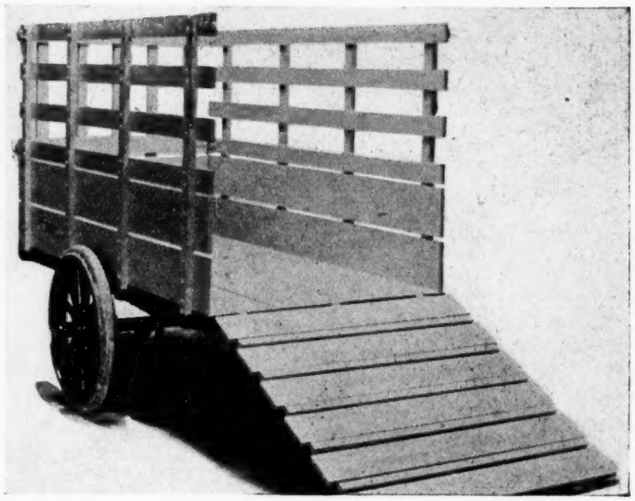
chance of a stall than a motor truck is expected to do. That would not be good business. But it is based on—

(1) Increased load capacity due to a better fit to the work on hand than normally may be expected of an unchangeable and uncompromising motor truck unit.
(2) Suitability for loads so awkward in shape, bulk or weight that the motor truck cannot handle them.
(3) Compound transportation unit, flexible in its application to work of varying demands and suited for keeping engine power and man power profitably employed during all the working hours.



Simple construction of typical two-wheel trailer with drawbar attached to pintle hook secured to the motor unit. The frame shown is adapted for receiving a stake body

Labor recognizes the last-mentioned point when it usually demands a somewhat higher wage where trailers are regularly employed. It wants a share in the advantages, and usually gets it. It gets the same in other cases without giving the value in work which is secured automatically by the trailer system properly organized.



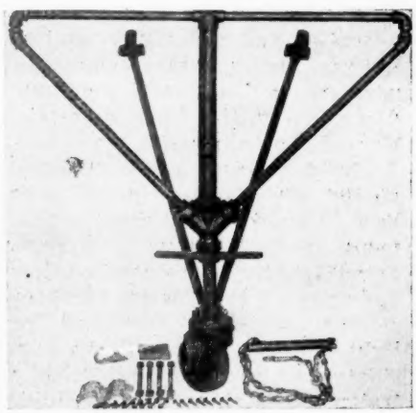
Light two-wheel trailer intended for transporting of one head of cattle and provided with hinged end gate than can be used as a ramp, as shown

The semi-trailer type is often employed solely to gain the operative advantages of a "divisible unit," including that of the short turn, and this type has already reacted upon the motor truck industry with great force, causing short-wheelbase trucks or tractors to be manufactured specially for semi-trailer service. The tractor, the truck and the trailer are blended in variable proportions in this compound transportation unit.

Mechanical Construction

Much has been written on these fundamental matters and they are perhaps clear in principle to a majority of those interested, but when it comes to choosing a trailer outfit its mechanical construction detail and the relation of such detail to the work contemplated naturally enter for consideration.

The parts are not mechanically complicated, and generally accomplish what the maker intended, but there is some difference of opinion as to the necessity or importance of the functions. The intentions vary somewhat according to the views held, but more according to the type of the trailer outfit. The main points of interest in this respect are indicated in the accompanying illustrations and their captions. Some of the leading ideas



(To the left) Heavy two-wheel trailers known as "flats" are sometimes used with a truck as the motor unit. The connecting bar is adjustable in length and height and is hinged to a cross member of the trailer frame. The trailer load can be dumped automatically by releasing a lock on the drawbar and backing the trailer slightly, forcing the center of gravity backward beyond the vertical plane of the axle. Upon moving forward, the pull of the drawbar brings the body back into the horizontal position and locks it to the drawbar automatically. Folding screw jacks serve to uphold either end. (To the right) One of the folding screw jacks with caster foot. A similar jack is sometimes used for light semi-trailers

This group shows typical semi-trailers in use. (Upper) The fifth-wheel connection is here automatic and the required rocking movement in the relations of the trailer to the motor unit is effected by two rollers which also steer the two units into or out of hitch, running on rails with converging guide flanges. The foldable front support of the detached trailer takes the form of two substantial wheels. (Center) The use of dump bodies for semi- trailers is here exemplified. (Lower) The heavy structure, carrying the motto of the trailer industry, is provided with a telescoping folding jack, for supporting its front end, having a foot that rocks freely to perpendicular or slanting positions of the jack

in connection with this phase of the subject may be briefly mentioned separately, however.

If the trailer reduces the road speed, some of its advantages are lost, and it is therefore the aim to produce a construction which admits of as high speed as for a motor truck alone. In practice motor truck speed is perhaps actually reduced an average of 10 per cent to 15 per cent when the load is doubled, owing to the larger amount of work done and more frequent employment of the lower gears, but the speed consideration has led to very substantial construction of trailer chassis and to the adoption of interesting devices for securing accurate steering, approximate tracking, elimination of slamming in couplings, avoidance of shifting of loads and of all independent accelerations and decelerations of the trailer. Backing and maneuvering call for other mechanical provisions. The needed facilities for coupling, uncoupling, loading and unloading vary for the different types.

The ideal, mechanically, would be to have all trailer outfits perfect and foolproof on these points, but cost, weight and simplicity of construction are also involved, and the requirements vary greatly in importance as between outfits intended for 5 to 10 miles per hour with loads of 5 to 20 tons and other outfits meant for 15 miles per hour or more with loads which may be of great length or volume but of relatively small weight. The suitability of the mechanical equipment of trailers can, therefore, scarcely be judged on general principles but only with sharp reference to the line of business for which they are designed and the nature of the roads in the territory where they are to be operated.

The same may be said of choosing among the four types of outfits. In all cases there is a premium for applying to the limit the traffic manager's common sense and experience in his line of transportation work, while in the selection of motor trucks good business judgment is not enough but must be supplemented by scholarly insight in engineering and positive knowledge of the truck data which experience has established. The unaided business man must usually rely in large degree on commercial faith in buying motor trucks, but in buying trailers his own competence can easily be made good enough.

Summary of Mechanical Requirements

The requirements and functions which must be reflected in the mechanical equipment of trailers may be summarized as follows with special reference to each of the four types and to train formation:

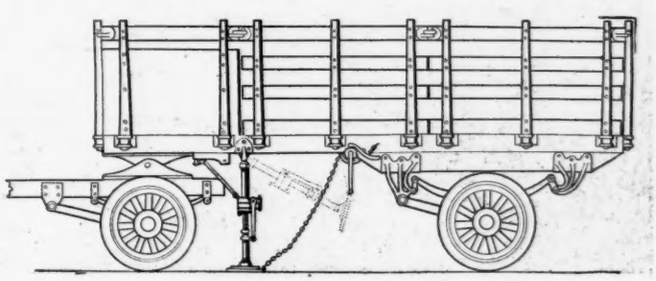
Four-wheel Trailers—Operation by one person, and he the driver of the motor unit.

Coupling and uncoupling handy, safe and reliable but not necessarily automatic.

Double-cushioned drawbar action.

Automatic steering in tow.

Tracking with driving wheels of



Twin screw jacks hinged to trailer frame and arranged to be folded away by chain and winch. Both jacks are raised or lowered in unison by a crank from either side, but each may be adjusted independently

motor unit, approximate or as close as demanded by law.

Backing and maneuvering.

Braking, if high speeds or hilly roads are factors.

Reversibility, if required.

Two-wheel Trailers—Simplicity is the keynote for this type, which is usually intended for light loads balanced over the axle.

When intended for heavier work, drawbar and couplings should be equal to those required for four-wheeled trailers and should tend to prevent teetering.

Supports for either end when the vehicle is unhitched, to facilitate loading.

Semi-trailers—Operation by one person, and he the driver of the motor unit.

Equivalent of double-cushion drawbar action.

Adequate support for front end when unhitched, adjustable in height.

Simplicity of coupling and uncoupling, preferably automatic.

Pole-dollies—These share the nature of semi-trailers in some degree, as a portion of the load is always supported on the motor unit.

Adjustability to length of load, by extension reach.

Provision against shifting and twisting of load.

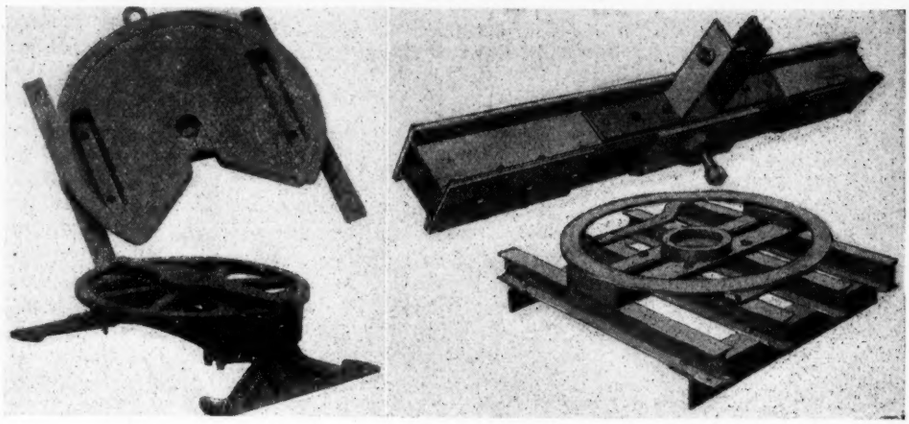
Equivalent of double-cushioned drawbar action, for heavy loads.

Train Formation—Four-wheeled trailers intended for use in train formation must have a steering and tracking system that will operate properly for this condition of service.

Close tracking, essential for short turns.

Reversibility, with drawhead for coupling at either end.

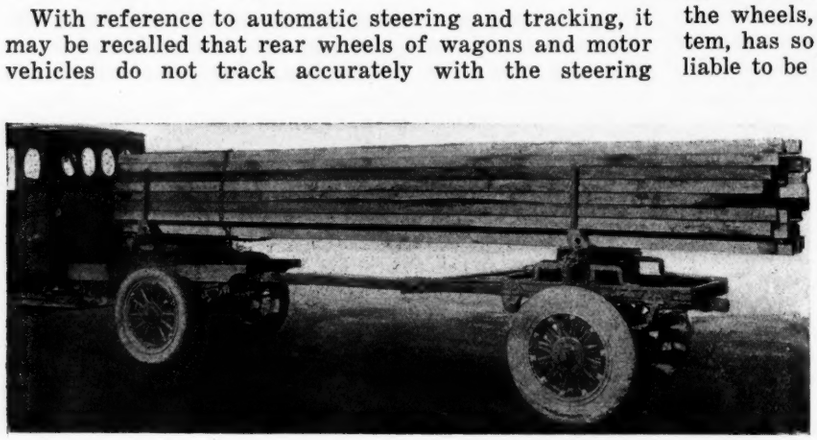
Trains of semi-trailers are not known to be in use.



(Upper left) To make the fifth-wheel device couple automatically, a type has been developed in which the lower disk has a gate with converging edges and spring actuated locking jaws which close around the kingbolt in an annular groove when motor and trailer units are brought together. (Lower left) In semi-trailer equipment the fifth-wheel coupling is paramount, as it must transmit the traction pull, must cushion starting and stopping actions, steer the trailer and permit the latter varying relations to the motor unit. The top disk is bolted to the underside of the trailer body or frame and carries the kingbolt which couples the upper and lower disks, so as to maintain continuous contact between them and avoid wobbling. The lower disk is pivotally mounted by means of a transverse bar in brackets secured to the motor unit, so as to admit of forward and backward rocking, and the bar is held between drawbar springs allowing as much other movement as is necessary. (To the right) Details of a fifth-wheel device intended for a heavy pole-trailer. Rocking movement is effected by using a single transverse bolt for connection of the bolster with the adjustable trailer pole. Load chocks and adjustment chains are used, but are not shown

Steering and Tracking Automatic.

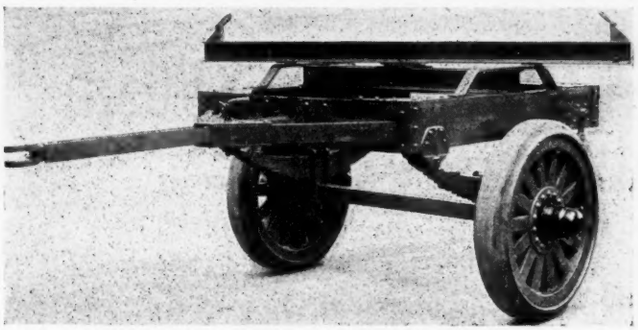
With reference to automatic steering and tracking, it may be recalled that rear wheels of wagons and motor vehicles do not track accurately with the steering wheels, but each wheel follows its own curve. To track accurately, it is evident that the follower-wheel should not begin to turn until it arrives at the spot where its leading wheel began turning, but the follower-wheel, when left free, begins turning at the same moment (instead of at the same spot) as the leading wheel. Close tracking must, therefore, be forced by positive mechanical action and consumes a little more power than free turning. It causes more tire strain and wear. It seems also probable that an automatic steering and tracking method, by causing the wheels to depart from the lines of smallest resistance in a more or less irregular manner—if the design is imperfect—may become responsible for a tendency to "snaking" at the higher speeds, considering that most road tracks are more or less tortuous while all positive mechanism for guiding the wheels, including the automobile or Ackerman system, has so far been only approximately correct, and is liable to be less correct when close tracking is aimed for.



Pole-trailer at work in lumber business. Shows similarity to semi-trailer type, but towing connection between the units is by adjustable pole, and load rests on swiveled bolsters and is closely held between laterally adjustable chocks and stakes forming parts of the bolsters

The trailer industry, as the illustrations show, employs both the Ackerman and the fifth-wheel methods, opinion being divided with regard to their comparative merits. Tracking may be approximated sufficiently well by either, depending much on details in design and workmanship. The issue between the two methods may be decided by considerations of load space and body shape. Side dump bodies, for example, find a large available space with low drop frames and rod-steering than two fifth wheels would allow.

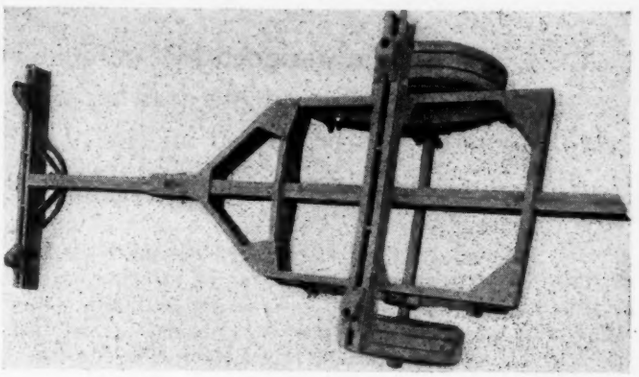
As to the degree of accuracy in tracking which is provided, we are practically stopping now at the idea that front wheels of each unit are made to track quite closely with rear wheels of the preceding



Pole-trailer with long pole adjustable, with a locking device in the trailer frame, to different distances from the motor unit, to which it is coupled by eye and pintle hook. Front end of load rests on bolster swiveled to platform of motor unit, similar to swivel bolster on trailer

unit, speaking of four-wheel trailers, but rear wheels are left free—a sensible compromise favoring simple construction and applicable in train formation.

Questions relating to the steering system are subject to debate, of course, and may be more fully elucidated with diagrams, but they are overshadowed in practical importance by questions of progress in couplings and supports. These apply particularly to semi-trailers, but also to two-wheel trailers and dollies. It is reserved for inventive ingenuity to make them more fully automatic while losing none of their present dependability.



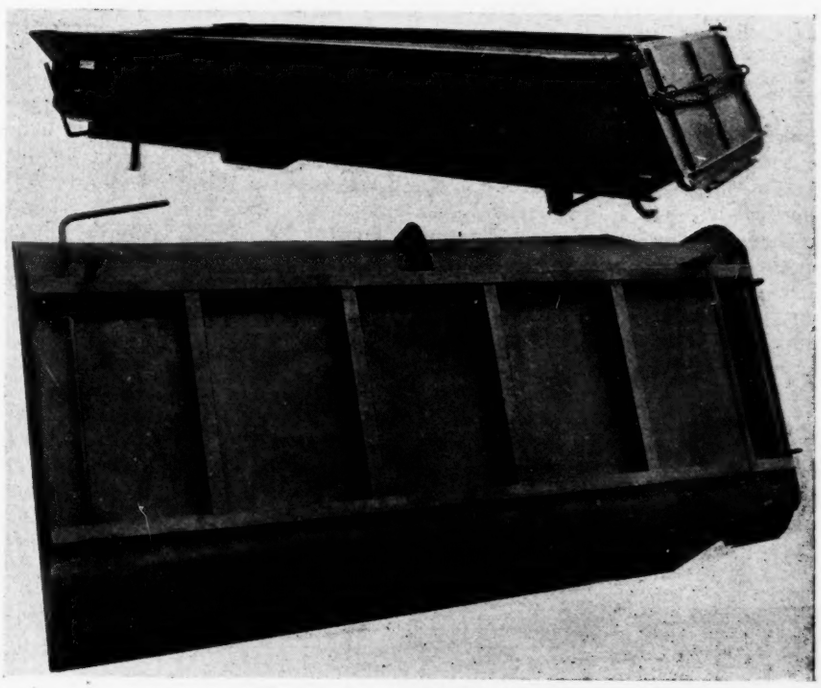
When intended for heavy loads the adjustable pole of the pole trailer is sometimes provided with the upper portion of a fifth-wheel coupling and a front bolster integral therewith, and neither front nor rear bolster is then swiveled. The picture shows adjustable load chock arranged for receiving round stakes

New All-Steel Truck Body

METAL construction, strangely enough, has not made as much progress to date in connection with truck bodies as with passenger bodies, although the service conditions in truck work are much more severe. Herewith are shown two photographs of an all-metal truck body made in Kansas City, in the production of which the electric welding process plays an important part.

The body is practically one piece, for the individual parts are welded together electrically. The longitudinal sills and cross sills are formed into a girder-like structure and provide a rigid bed to which the body itself is welded. This construction produces a body with a smooth interior, which is an advantage when hauling clay and similar materials, as there is then very little tendency for the load to adhere to the body when the latter is tilted.

Another feature is the double acting tail-gate which can be opened either from the bottom or the top. When opened from the top the two cotter pins are removed, as shown in one of the photographs, and the opening may then be regulated by the adjusting chain.



Two views showing the construction of the all-steel truck body

AN average of 120 pounds of aluminum is used in the manufacture of all automobiles—Fords excluded—according to a brief filed by the National Automobile Chamber of Commerce with the Ways and Means Committee of the House of Representatives. This figure was obtained from the Aluminum Company of America and it refers to the allotment of the crude aluminum set apart for the automotive industry by this company. In some cars the weight of aluminum used is as high as 250 pounds. The automotive use of aluminum is estimated at 120,000,000 pounds, 60 per cent of the production.

The brief was filed as supporting the request that the present duty on aluminum of two cents a pound should not be increased. One of the present obstacles to the use of aluminum in our industry is the price and if the tariff is removed, the demand for the metal would increase.

A British Traction Dynamometer

Instrument designed by National Physical Laboratory intended primarily for use in measuring drawbar pull of tractors. Hydrostatic pressure on plunger is registered on Bourdon gage and recorded together with time on paper arranged to travel at a speed proportional to that of the tractor.

THE National Physical Laboratory designed a special traction dynamometer which can be inserted between the tractor and plow without interfering with the control of the plow by the tractor operator for use at the farm tractor trials held at Lincoln, England, during the fall of 1920. To make this possible the recording instrument is separated from the dynamometer proper and placed on a light wheeled carriage which is towed alongside the tractor under test. The following description is abstracted from an article which appeared in *Engineering*.

The coupling between the tractor and plow consists of a cylinder and plunger, the former being attached to the draw-bar of the tractor and the latter, through links, to the plow. The pull on the coupling sets up a pressure in the oil confined in the cylinder, and this pressure is transmitted to a recording pressure gage by a flexible hydraulic tube. The best flexible tube that could be obtained would safely withstand an internal pressure of only one ton per square inch without reduction of flexibility, and as the dynamometer was required for pulls up to 3 tons, a diameter of plunger of approximately 2 in. was necessary.

The cylinder was made of steel and the plunger of bronze, the clearance between the two was made 0.001 in. and the plunger was provided with a very thin packing ring of oiled leather. In order to avoid the use of a gland the drawbar pull was converted to a thrust on a plunger by means of the links L, L, and the pins P_1, P_2. The thrust on the plunger is transmitted through the second plunger E, which is suitably guided in a continuation of the cylinder, and the connection between the two plungers is a loose one in order to allow the larger plunger to float freely in its cylinder. The pin P_1 passes through the slots in the guide-piece.

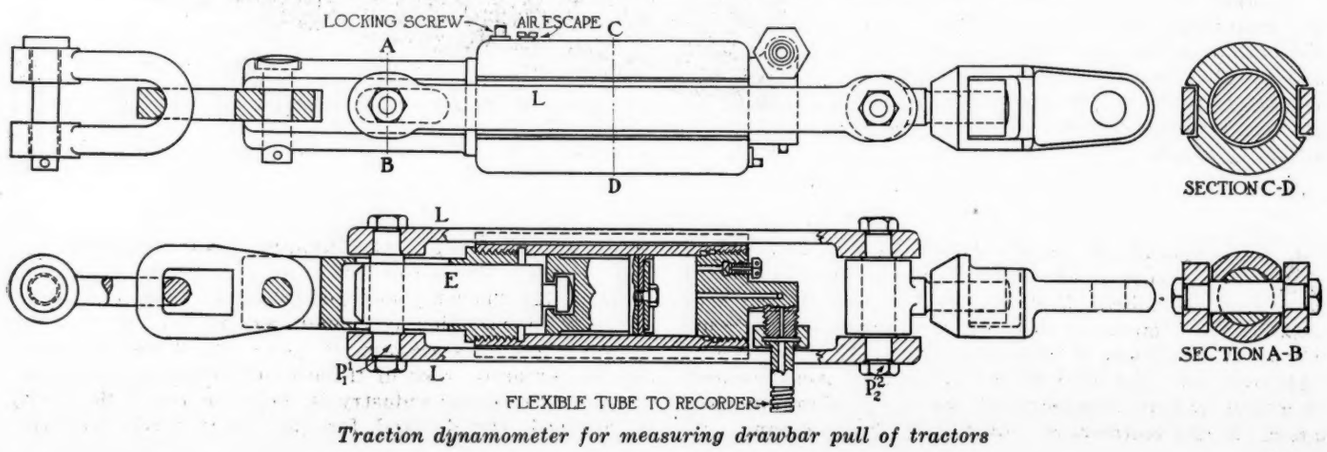
The connection to the tractor draw-bar was made in such a manner that the cylinder could rotate, and the opposite end of the dynamometer was provided with a swivel attachment for the plow. A rubber cover over the front portion served to exclude dust and grit from interior of cylinder.

The recording instrument consists of a standard Schaeffer & Budenberg pressure recorder modified for the present purpose by the addition of a second Bourdon tube, a clock, and the paper driving device. The recording paper is driven through gearing and a chain from one of the carriage wheels, and three speeds of the paper are provided for, namely, 1 in. of travel to 100 ft., 50 feet or 10 ft. motion of the carriage over the ground. The speed-change can be made while running if desired. As the recorder proper rests on the thick felt pads, the final drive is made by means of a leather vee belt, with tension adjustment. The hydraulic tube from the dynamometer is connected to a small valve-box, by which the pressure can be diverted to either of two Bourdon tubes.

The motion of the end of each Bourdon tube is magnified by a pen mechanism which is such that the travel of the pen is 4 in. for a maximum draw-bar pull of 4000 lb. using one of the tubes, and 3¾ in. for a maximum pull of 7000 lb. using the other tube. The pen mechanism can be transferred to either tube during a test if required.

A clock is provided for indicating time on the record paper. An electrical contact is made at equal pre-determined intervals of time which can be varied from 2 seconds to 6 seconds, and the time recording pen, which normally draws a straight line, is momentarily moved to one side when the contact takes place. A robust escapement from the clock is provided and in order that the number of time intervals indicated can be readily counted, every fourth contact is missed. Another similar pen is provided for recording revolutions of the tractor engine, or of the tractor driving wheels.

An oil pump taking oil from a small reservoir placed under the carriage, serves to prime the dynamometer and recorder. This pump is shut off when the apparatus is working. Measured distances on the chart between indications of equal time intervals are directly proportional to the speed, because the travel of the paper is proportional to the distance traveled. The average speed for an interval of 5 seconds can, therefore, be readily obtained, and the curve of speed plotted on the chart.



Traction dynamometer for measuring drawbar pull of tractors

A Budget Control System Which Is Producing Results

Manufacturers are taking special interest in the selling methods of dealers and distributers. This article gives valuable information which might be suggested to any distributer. The system deals with a branch-organized concern, but can be modified to suit other conditions.

By Norman G. Shidle

THE efficiency of budget control of finances has never been seriously disputed, but along with other recognized theories for good business administration such control is not always practiced. The present industrial situation emphasizes anew the necessity for business efficiency and demands in no uncertain tones a more economical and efficient expenditure of whatever funds are at hand.

Manufacturers are taking particular interest in the merchandising methods of their distributors and dealers, and are aiding in every way the intensive sales efforts which are being put forth. Probably no aid of greater value could be rendered than by the suggestion of a means of budget control which would eliminate waste and require a minimum effort for operation. Such a system has been developed at the Packard-Chicago distributors, and has been in successful operation for over a year.

The chief functions of this system of budget control, which is supplementary to the regular accounting system, may be enumerated as follows:

1. To enable the management to know at any time the exact status of the business.
2. To enable the management to pick out weak spots in the organization immediately and to bolster them up before any considerable damage has been done.
3. To place accurately and definitely responsibility for success or failure in a particular case.
4. To enable both distributer and branch manager to know which departments are making money and which departments are not making money. In other words, one department which is inefficiently operated cannot hide its deficiencies under cover of a total profit for the business.

The general purpose of the system may best be described by quoting from a talk made by C. G. Embleton, general manager of Packard-Chicago, when the budget plan was first presented to the branches. He said, in part:

"A budget system can be favorably compared to the governor on a truck. A truck without a governor is in a position to run wild at any time, and before long runs itself to destruction. Without some sort of a budget system, a business can also run wild up to the point of destruction, just as the truck can.

"A budget system is not a theory—it is a practical and necessary part of a business. Without such a system, the management is not in a position to purchase intelligently, whether it be the purchase of material or man-power. Without the budget you are not in a position to definitely know what to purchase and when, or how much money to spend at certain points.

"A budget plan, such as we have worked up, certainly will place the management in a position to know our business and how we stand at all times, and this also applies to every department head in our organization to whom will be handed that portion of the plan covering his particular department.

"Often we feel quite confident that a certain department is getting along in good shape, basing this opinion on their sales record and apparent efficient handling of their business, yet this analysis that we have taken brings to my attention a department that is not in healthy condition at all, and yet, prior to this analysis, I was of the opinion that this particular department was being handled in a very satisfactory manner.

"This plan will enable us to immediately draw our attention to the department that is weak. This being brought to our attention permits us to concentrate on this particular department and find out just what brings about the weakness as shown. It may be that the department is under-organized. It may be possible that there is too much help—too many of the wrong sort and not enough of the proper kind. It may be that the department will call for an extra advertising effort. At any rate, this plan will point out weakness, if any, which will permit us to take the necessary steps to strengthen."

The system devised is simple both in principle and application, but calls for a very careful and detailed study if its operation is to be thoroughly clear. To understand the working of the system, a general knowledge of the form of organization used by this firm is necessary. This does not mean that the system is applicable only to firms with a similar form of organization; on the contrary, it is adaptable to almost any of the usual forms of business organization. The purpose of presenting the chart of this particular concern is simply to facilitate a detailed explanation of the system.

The chart shown in Fig. 1 indicates the form of the Packard-Chicago organization. It will be noted that under the general manager there are four departmental managers, beside the advertising and financial managers who need not figure in this description. The service manager handles both parts and repairs. The budget administration is divided into these parts:

1. Carriages.
2. Trucks.
3. Accessories.
4. Parts.
5. Repairs.

In addition, however, the various branches function directly in connection with the general manager as well as indirectly through the various department heads. Each

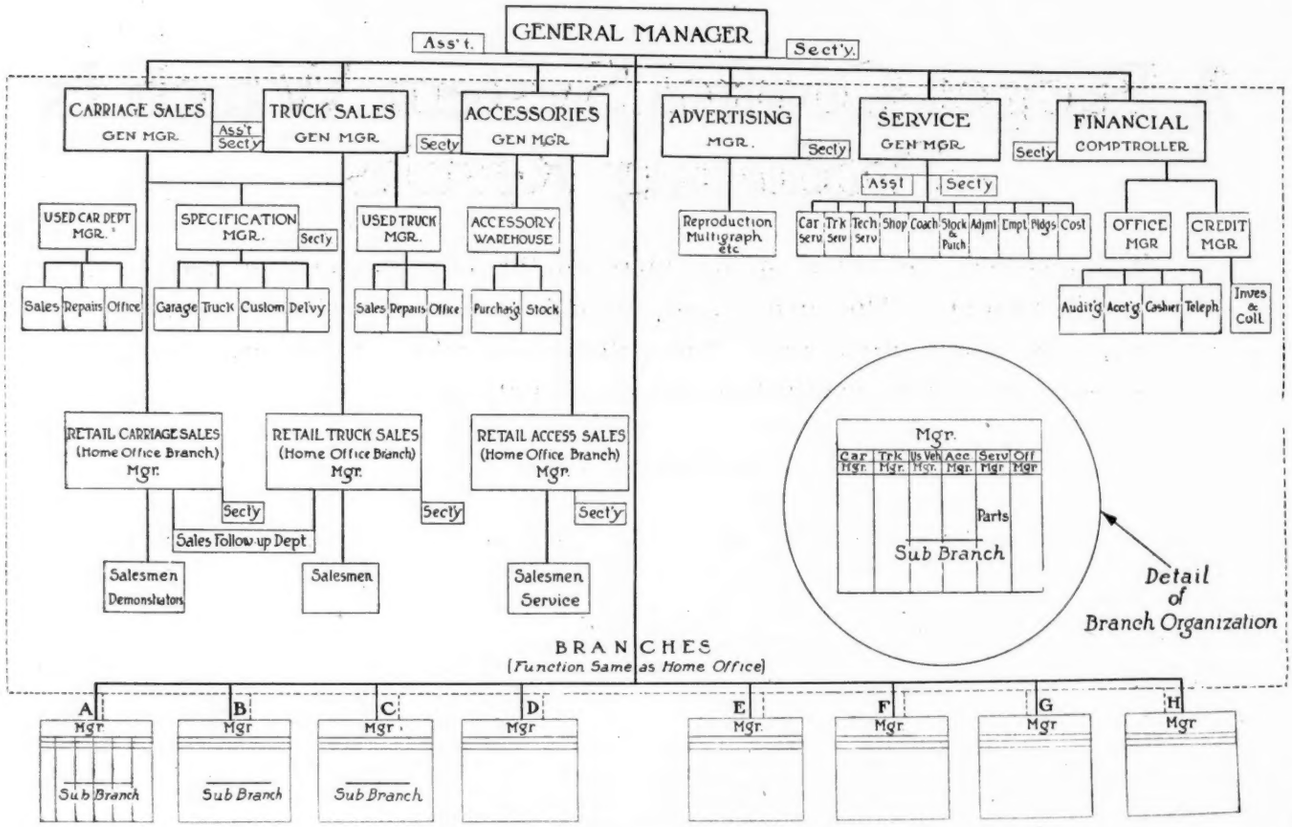


Fig. 1—Packard-Chicago organization chart

branch in turn has its operations divided into the five parts mentioned above, the branch organizations individually following the general lines of the main office organization. In the case of the smaller branches, of course, that organization is not carried out to as many refinements or with so large a staff, but in all cases the five departments—carriages, trucks, accessories, parts and repairs—are separately accounted for.

It may be well for the time being to forget the department managers, and consider simply the direct relationship between the general manager and the branch manager, for it is through this channel that the chief part of the system functions. The part played by the main office department heads can be fitted in later.

The first step is the determination of a quota for the year for the entire organization; that is, the number of vehicles which must be sold. The fiscal year extends from Sept. 1 to Aug. 31. The budget system is laid down to apply on the fiscal year and consequently the quota is determined by two operations:

1. Taking an inventory at time of beginning budget system.
2. Adding to that the shipment from the factory scheduled for next eleven months (assuming that system was installed at beginning of a fiscal year).

Since deliveries only, and not sales contracts, effect profits, shipments made during the month of August are not considered in the budget for the particular year, since the shipments made during that month will not be deliveries until the following year. This inventory of stock on hand and shipments to be received give the total of carriages which are to be sold. A similar form is used for trucks, accessories, parts and repairs, but the carriage forms will be used here alone to simplify the discussion.

The figure so determined is listed at the top of the form illustrated in Fig. 2. To make plain the operation, hypothetical figures may be inserted in the form. In this case, the quota for the entire carriage organization may be assumed to be, for instance, 800. Referring still to Fig. 2, the next figure to be filled in is the "average sales price," which may be assumed to be $5,000. This can be readily determined, of course, by dividing the total sales

Entire Organization

CARRIAGES

Fiscal Year Ending August 31, 1920

Quota—800

% of Quota	100%
Average Sales Price	$5,000
Gross Profit per Truck	$1,000
Net Profit desired—8% of Gross Sales	
Gross Sales	$4,000,000
Gross Profit	800,000
Net Profit	320,000
Allowable Expense	480,000

Average monthly deliveries made uniform by Gen. Mgr. and Dept. Mgr.

Month	
Sept.	6
Oct.	5
Nov.	4
Dec.	3
Jan.	4
Feb.	5
Mar.	12
Apr.	14
May	15
June	12
July	10
Aug.	10
Total	100

Branch	Veh.	% Quota	Gross Sales	Gross Profit	Net Profit Desired	Expense Budget
A	100	12½	$500,000	$100,000	$40,000	$60,000
B						
C						
D						
E						
F						
G						
H						
I						
Total	800	100%				

Fig. 2

HOME OFFICE
REPORT FROM BRANCH "A"
CARRIAGE

Budget Distribution by Months—Fiscal Year Ending Aug. 31, 1920

Month	Vehicles			% of Quota		Gross Sales		Gross Profit		Expense		Net Profit		% to Sales	
	Sales	Quota	Del's	Quota	Del's	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
Sept.	8	6	5	6%	5%	$30000	$27000	$6000	$5500	$5000	$3610*	$1000	$1890	3.33	7
Oct.															
Nov.															
Dec.															
Jan.															
Feb.															
Mar.															
April															
May															
June															
July															
Aug.															
Total		100		100		$500000		$100000		$60000	*	$40000		8	

*Expense figures include Net Profit of Used Car Dept.

Fig. 3

price of the allotment by the number of vehicles comprising the allotment. Next the gross profit per carriage is inserted; this is simply the difference between the buying and the selling price of the vehicle, and is in this case assumed to be $1,000.

The net profit desired is 8 per cent of the gross sales. Next are inserted the figures for gross sales and gross profit, both of which are readily calculated on the basis of figures already given. Since a profit of 8 per cent on gross sales is desired the net profit will be in this instance $320,000.

Subtracting this desired net profit from the gross profit of $800,000, the allowable expense figure of $480,000 is found. That is, $480,000 can be spent by the entire carriage organization in selling the quota of 800 and still make the desired profit of 8 per cent.

The data so far presented may in a sense seem to be "primer" material, but its chief utility is in its very simplicity. That is, the reasoning is simple enough, but the advantage lies in the clear, concise picture which is presented of the information as shown in Fig. 2.

Next the average monthly deliveries are filled in by percentages. By taking as an approximate basis the monthly averages for the three previous years, the percentage of the entire new quota which should be delivered each month is approximately determined. By means of this budget, a check on the selling progress of the entire carriage organization is available month by month. A certain percentage of the entire quota must be sold each month, and any "falling down" can be immediately checked.

A certain proportion of the entire quota is then assigned to each of the various branches. The individual quota of a branch is determined by records of previous years, together with an analysis of financial statistics for the particular region. In connection with estimating the sales possibilities of a particular territory, the financial statistics have been found to be a far better unit of measure than population figures; especially is this true as regards possible carriage sales.

On the bottom of this form, then, is listed by branches the number of vehicles to be sold by each branch during the entire year, the percentage of the total assigned to each branch, the gross sales in dollars expected of each branch, the gross profit desired, and the expense budget, that is the amount of money which may be expended by each branch in selling its assigned quota.

Thus, on this one sheet, is presented at beginning of the year in brief and clear form these things:

1. Quota for entire carriage organization, and total expenditures allowable for selling that quota.
2. Percentage of quota which must be sold each month by entire carriage organization.
3. Quota for each branch, and expenditure allowed to be expended by each branch to sell that quota.

This form presents in a broad way the task of the carriage organization, the scope of its work, and the limit of expenditure. This information is made available for the chief executive at a glance.

Centralized Cost Accounting

It must be noted at this point that the accounting for all the branches is handled through a central accounting department at the main office. That is, retail representatives of this organization who correspond to the ordinary dealers as regards sales functions, are really branch managers. Their bills are paid through the main office, and the costs of the various divisions of each of the branches are recorded and compiled at that central accounting office.

About the middle of every month, a balance sheet report for the previous month, together with a detail record of the expenses for his branch, is sent to every branch manager by the accounting department. These expenses are subdivided under the following classifications:

Miscellaneous Supplies.
Shop Tools.
Repairs to Machinery and Tools.
Repairs to Buildings, Fixtures and Equipment.
Power, Light, Heat and Water.
Errors and Allowances.
Miscellaneous Expense.
Rent.
Stationery and Office Supplies.
Telephone.
Telegraph.

"A" BRANCH

Comparison—All Departments—with Budget—August, 1920

Div.	Vehicles			%		Gross Sales		Gross Profit		Expense		Net Profit		% to Sales	
	Sales	Quota	Del's	Quota	Del's	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
Carr.											*				
Trk.															
Access.															
Parts															
Repairs															
Total											*				
TOTAL TO DATE															
Carr.											*				
Trk.															
Access.															
Parts															
Repai s															
Total											*				

*Expense figures include Net Profit of Used Vehicle Departments

Fig. 4

Postage.
Traveling
Entertainment.
Service Vehicle Operation.
Legal and Auditing Fees.
Contributions.
Membership Fees.
Receiving and Shipping.
Guarantee Service.
Policy Service.
Vehicle Inspection.
Advertising—Classified.
Advertising—Circularization.
Advertising—Display.
Advertising—House Organ.
Advertising—Miscellaneous.
Exhibitions.
Meetings and Conventions.
Demonstrating.
Vehicle Delivery.
General Labor.
Defective Workmanship.
Idle Time.
Supervision.
Clerks and Stenographers.
Salesmen's Salaries and Commissions.
Parts Handling.
Expense Recharged.
Total Direct Expenses.
Indirect Expense.
Total All Expenses.

An examination of the figures included in these reports enables the branch manager to fill out each month the columns marked "Deliveries and Actual" on his copy of the form shown in Fig. 3, original of which is in the general manager's office.

Fig. 3 shows the form upon which a branch manager reports each month to the general manager the progress of his carriage sales. He fills out a similar form for trucks, accessories, parts and repairs.

An examination of Fig. 3 will show that approximately one-half of the columns are filled out at the beginning of the year; that is, the figures which go into them comprise the budget limits for the particular branch. The first column, "Sales," is used simply for general information and does not enter into the budget system, since, as previously explained, only deliveries count. The "quota" columns under the general head "Vehicles" and "Per Cent of Quota" are filled out at the beginning of the year on the basis of the figures compiled and recorded on the form shown in Fig. 2. The same is true of the columns marked "budget" under "Gross Sales," "Gross Profits," "Expense," "Net Profit," and "Per Cent to Sales" records the percentage relationship of the net profit to sales for the month.

The other columns, then, are to be filled in by the branch manager every month, after he has received his cost figures from the accounting department. To make the operation clear, we may again insert hypothetical figures, taking the month of September as an example.

Referring back to Fig. 2, it will be seen that 6 per cent of the entire quota should be sold during September and that the "A" branch was assigned an actual quota of 100 carriages for the year.

Then 6 per cent of that 100 is 6 carriages, which comprise the quota for September. In the same way, using the basis established on Fig. 2, the gross sales budget for carriages for September is $30,000 and the gross profit budget $6,000. The gross expense budget is simply prorated equally for each month of the year, because it was found that an excessive amount of accounting procedure would be necessary if an attempt were made to pro-rate the expense budget in accordance with the varying expense of each month. Thus the expense budget for September would be merely one-twelfth of the yearly budget or $5,000. The next profit budget total for the year is figured at 8 per cent of gross sales, but because of expense distribution being equal, the monthly budget profit per cent varies, and we see that this month only calls for 1000, or 3.33 per cent for the carriage department of this branch. Though expense is equal in its distribution, the net profit per cent called for in later months will of course be higher, due to deliveries being seasonable, and the total budget for the year as mentioned above will be 8 per cent.

The balance sheet and expense accounting reports, from the main office, it is evident, are necessary for filling out the "Actual Gross Profit," "Actual Expense," and "Actual Net Profit" columns. This entire budget system is supplementary to a thorough and efficient accounting system, the

Entire Organization—Carriage Master Sheet Comparison—By Branches—August, 1920

	Vehicles			% of Quota		Gross Sales		Gross Profit		Expense		Net Profit		% to Sales	
Branch	Sales	Quota	Del's	Quota	Del's	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual
A											*				
B															
C															
D															
E															
F															
G															
H															
I															
Total											*				

TOTAL TO DATE

A											*				
B															
C															
D															
E															
F															
G															
H															
I															
Total											*				

*Expense figures include Net Profit of Used Truck Depts.

Fig. 5

purpose of the budget system being to limit expenditures, map out necessary achievement in advance, and present to both general manager and branch managers at any given time a clear and brief picture of the exact status of the business and all of its component parts.

Each branch manager, then, fills out each month a copy of Fig. 3 or each of the five departments of his branch, and studies them, while waiting comments from the general manager. Before noting the further use of the assembled branch office reports made by the general manager, it is well to note the use of the reports to the branch manager.

The form described enables the branch manager to determine immediately whether or not his carriage department is operating as effectively as it should. He knows each month whether each of his departments is yielding the fair profit desired. It is not enough that his branch is making money, each department must be operating profitably. By these five similar forms, the progress of each department is noted separately, and he is informed immediately by this record if any unit is not coming up to the standards set.

He can compare, at a glance, the actual expense with the budget of allowed expenditures. If that actual expense is higher than it should be, he can immediately refer to his detailed cost list and determine what expenses have been too heavy, and whether or not the increased expenditure was justified.

In addition to these five separate similar forms of each department, the branch manager is given each month the form shown in Fig. 4. This form comprises the same data as Fig. 3, except that the presentation is made in a different manner and brings out different points. Fig. 4 shows the comparative status of each of the various departments for the month, and below, the comparative status of the departments to date for the year. The branch manager can see, at a glance again, what departments are falling down, what departments are operating successfully. A duplicate copy of Fig. 4 is handed the general manager every month, together with an analysis, by the general manager's assistant.

From these reports data is compiled for the general manager which place before him a detailed, yet brief and concise, picture of:

1. The entire business.
2. The status of a particular branch.
3. The status of the various departments of a particular branch.
4. The status of the various departments of all branches combined.

When the form shown in Fig. 3 comes to the general manager, a summary of them is compiled and presented to the executive on an exactly similar form. Thus the executive has on Fig. 3 the same information for the entire organization that the branch manager has for his own branch. In like manner, the general manager has prepared a form similar to Fig. 4, which presents to him the facts in this classification for the entire organization. These forms differ only in that one is headed "A Branch," and the other "Entire Organization."

Thus Fig. 3 gives the general manager the month by month progress of one department of all the branches combined, a copy of which is given the division manager, thus effecting a united tie-up of sales effort and cooperative direction along lines of good business.

Fig. 4 gives him the status of each of the various departments of all branches combined, both for the preceding month, and to date for the year.

The general manager is enabled to compare at a glance the status of the various branches by reference to the form shown in Fig. 5. This form is compiled from the same data as was used in connection with Fig. 3, but is differently arranged in order to present a different phase of the business status. It shows the relation of the business of each branch to the budget for the preceding month; along with the same information for each branch to date for the year.

The forms shown in Figs. 6, 7 and 8 are almost self-

Comparison of Gross Profit, Expense and Net Profit, *by Amount*

12 Months Ended 8/31/20

BRANCHES

	A	B	C	D	E	F	G	H	I
CARRIAGE Gro. Prof. Expense Net Prof.									
TRUCK Gro. Prof. Expense Net Prof.									
ACCESSORY Gro. Prof. Expense Net Prof.									
PARTS Gro. Prof. Expense Net Prof.									
REPAIRS Gro. Prof. Expense Net Prof.									
TOTAL NET PROF. TO DATE									

Fig. 6

Comparison of Gross Profit, Expense and Net Profit *Percentages*

12 Months Ended 8/31/20

BRANCHES

	A	B	C	D	E	F	G	H	I
CARRIAGE Gro. Prof. Expense Net Prof.									
TRUCK Gro. Prof. Expense Net Prof.									
ACCESSORY Gro. Prof. Expense Net Prof.									
PARTS Gro. Prof. Expense Net Prof.									
REPAIRS Gro. Prof. Expense Net Prof.									
NET PROFIT									

Fig. 8

explanatory. These are prepared at quarterly intervals and are presented to the general manager as additional simplified data showing the status of certain phases of the business.

The form in Fig. 6 presents a comparison of gross profit, expense, and net profit for each department of each individual branch. The form in Fig. 7 is a comparison of gross profit, expense, and net profit average per vehicle by branches.

Fig. 8 shows a form on which the business of the various departments of the individual branches is compared on a percentage basis. The data on this form enables the general manager quickly to determine in a general way by the fairest yardstick which branches are doing exceptionally well and which ones are not coming up to the set standards.

It will be noted that the forms shown in Figs. 2, 3 and 4 are those which appertain directly to the operation of the budget system. That is, it is through these forms, and the other forms used, which are similar to them, that the actual operation of the business is compared with the standards set by the budget.

The other forms chiefly comprise data compiled from the information contained in the forms of Figs. 2, 3 and 4, but so arranged as to present clearly and briefly to the chief executive the exact status of any particular phase of any branch or the entire business at any given time. The forms shown in Figs. 5, 6 and 7 are little more than examples of an idea which is capable in innumerable variations and adaptations. That is, these same figures might be re-arranged and re-grouped in many other ways in order to present at sight certain other angles of the business. As a matter of fact, several other variations are used in the work of this organization.

If the budget control system consists in nothing more than the filling out of these forms, it would be comparatively barren of results and scarcely to be counted as profitable. The usefulness of the summarized information which can be placed before the chief executive in brief form is so obvious as to need no discussion. In no way other than the budget can the final net profit objective for the year be charted out and be made available by the easy stages of monthly comparisons.

The forms sent by the general manager to the branch managers, however, call for definite action. When these forms are first received by the general manager, he immediately dictates a short note to the branch manager upon any phases of that manager's report which seem to require it. Thus the attention of the branch manager is called to any deficiencies in his organization, and he is required to determine the "why and wherefore." Having done this he must reply to the comment of the general manager, explaining the reason for any trouble which has been brought to his attention, or noting the unusual circumstances which made the difficulty inevitable.

In this way every detail which goes wrong in any of the branch organizations is immediately apparent, and is immediately attended to and corrected. Such efficient action is obviously impossible without a budget system of some kind similar to the one described here. It is possible to know that a department is running behind only when a normal standard has been determined beforehand.

Comparison of Sales Price, Gross Profit, Expense and Net Profit, *Average per Vehicle*

12 Months Ended 8/31/20

CARRIAGES

BRANCHES

	A	B	C	D	E	F	G	H	I
Average S. P. Gro. Prof. Expense Net Prof.									

TRUCKS

	A	B	C	D	E	F	G	H	I
Average S. P. Gro. Prof. Expense Net Prof.									

ENTIRE ORGANIZATION

	CARRIAGE	TRUCK
Average Gro. Prof. Expense Net Prof.		

Fig. 7

It is necessary each year to make out Fig. 2 again, thus beginning every new year as though the system were starting for the first time insofar as the determination of the budget is concerned. This makes the budget for each year conform with current conditions and changes in the industry so that it always presents a fair standard by which to gage performance.

The system at Packard-Chicago is considered to have been highly successful in every way. As the operation continues further refinements and improvements are made, but the system as outlined here involves all the essential points necessary to insure an efficient and constant budget control of the various phases of the business. To George J. Saxon, assistant to the general manager, is due much of the credit for the effective working out and operating of this budget control system.

It has been impossible, of course, in an article of this length to explain every detail, but enough has been presented to show clearly how the system operates, and to indicate the workings of those parts not fully discussed here. The chief accomplishments of such a system of budget control are included in this list:

1. It simplifies for the chief executive the complex accounting reports and terms.
2. It gives the general manager and the branch managers simple, easily readable, concise pictures of the business.
3. It points out where control or greater effort are necessary and permits remediable measures at the time when they should do the most good.
4. It makes an accounting record a conversational picture instead of a set of cold figures difficult to interpret.

Cast Nichrome Carbonizing Containers

IN case hardening steel by the cyanide process, a great deal of difficulty is being encountered by reason of the short life of the containers which hold the molten cyanide. In the past these containers have been generally made of iron or steel, and these materials oxidize rapidly and holes burn through their walls, or cracks form in them. The loss of the container is not the most serious damage done in such a case, as the molten cyanide will leak through and destroy the fire brick lining of the furnace.

Recently, crucibles or containers of a nickel chromium alloy, known as nichrome, have been used for this purpose. Nichrome (which is made by the Driver-Harris Co.) has the valuable property that it resists corrosion at high temperatures. One of its earlier important applications was as resistance wire in electric circuits where the wire sometimes becomes exceedingly hot yet must not oxidize.

Cast nichrome can be machined readily with high speed tool steel, but owing to the toughness of the alloy the tools must be ground with special angles. The use of the alloy is practical at all temperatures up to 2000 deg. F. Not only does it not oxidize at these high temperatures, but it is also practically non-warping, retaining its shape up to the temperature limit mentioned. The alloy can also be forged when heated to the proper temperature, but it must be handled very carefully. It is malleable and ductile, but during the rolling and drawing operations, repeated annealings are necessary. It can be readily welded by experienced welders, by either the oxy-acetylene or the electric arc method. The operation calls for considerable skill, however, as welds of cast nichrome cannot be made in the same manner as a weld of cast iron or steel. Preheating is almost invariably necessary, and a thorough cleaning of the surfaces to be welded is important. The best results have been obtained by chipping, with an air or cold chisel, the surfaces of the parts to be welded, so that new metal is exposed. A flux is necessary for gas welding but not for arc welding.

Besides its great resistance to oxidization at high temperature, nichrome is resistant to the action of most acids and alkalies, hot or cold, and the castings are said to give satisfactory service in a great many applications in conjunction with the use of acids. The melting temperature of cast nichrome is 2660 deg. F., the softening temperature 2300-2200 deg. and the same working temperature 2000 deg. The specific gravity is 8.15. Its specific heat is 1.1 at 68 deg. F., and the weight 0.29 lb. per cu. in. It shows a Brinell hardness of 160-170 and a scleroscope hardness of 27-30. The coefficient of linear expansion is 0.0000091 per deg. F. between 32 and 212 deg. F.

Following are the physical properties at 70 deg. F.: Elastic limit, 40,000 lb. per sq. in.; ultimate tensile strength, 54,000 lb. per sq. in.; elongation, 1 per cent; reduction of area, 2½ per cent.

The physical properties at 1500 deg. F. are as follows: Elastic limit, 20,100 lb. per sq. in.; tensile strength, 24,500 lb. per sq. in.; elongation, 4 per cent; reduction of area, 4.3 per cent.

Experimental work done by the Driver-Harris Co. has led to the conclusion that the most efficient and economical cyanide furnace is one in which the cyanide pot is sealed into the furnace by means of a seal of chrome ore or magnesite. The seal is placed between the brick lining and the flange of the pot. In this type of furnace the waste gases of combustion are led into a separate flue, and there is, therefore, no connection between the combustion chamber and the hood which covers the cyanide pot. This method of construction effectually prevents the cyanide vapors from passing into the combustion chamber, thus prolonging the life of the nichrome cyanide pot.

Other advantages of the use of cast nichrome containers are a saving of cyanide, an increase in the life of the furnace lining and a more uniform temperature.

Cast nichrome containers are also used for lead hardening. Round, rectangular and bath tub shaped lead pots are made of cast nichrome in all sizes and weights, the largest being of 2000 lb. capacity.

For some years past cast nichrome has also been used for pyrometer protection tubes. Iron or steel tubes were formerly used for this purpose, but cast nichrome tubes are said to have proven much more durable. These tubes are supplied in either the plain, threaded or flanged forms, with either light or heavy walls.

The above information is taken from a book on Case Carbonizing published by the Driver-Harris Co.

THERE has been compiled by the Bureau of Standards for distribution, a table of equivalents of cubic feet in terms of cubic meters arranged in units from 1 to 1000 cubic feet; also cubic meters in terms of cubic feet, the arrangement being by tenths from 0.1 to 29 cubic meters.

What Dealers Think About Merchandizing New Models

There can be two reasons for a new model; one strictly a merchandizing reason, the other to keep the motor car up with the times. The latter point is for the engineers, and is not considered here. The dealers quoted in this article have decided opinions on the other point.

By Clyde Jennings

FOR what seems to be a very long time we had a market in which the factory capacity was the measure of car production. Now we are entering a period during which the car production will be measured by the selling capacity of the dealer.

This entire reversal of the situation makes for much more interesting circumstances. In the new circumstances there is not much of romance or thrill in the factory as a whole. It is only the production or labor man, who gets into the details which cannot be passed on to the public, who senses the thrill. There is too much that must be kept secret. In the recent past there was too much of "passing the buck" in the way of paying fancy freight rates and increased wages that were merely passed on to the public, through the kindly influence of the dealer. **Even the labor problem lost its savor when the men were merely bribed to work.**

During this period one very interesting observer remarked:

> **"We buy our automobiles from the man who insults us the least."**

Now it all is so different that it looks like a new world. The automobile selling situation, and in fact the entire industry, is like a landscape the morning after a big snow storm. Here and there is a spot where some dealer, who was happy in his factory connection, an optimist by nature and with something of the bulldog in him, just kept on selling. These dealers are the spots in this landscape where the snow has melted. Here and there is a larger spot where a factory, with a sales campaign unspoiled by days of hurry, has maintained production.

But in the main the landscape is unspoiled except by the memories which are covered. There is a fine opportunity for a new line of work. If this opportunity was mine I would do this thing as a starter:

> **Get very close to my dealers and hear what they think about my methods and what advice they have for the improvements of these methods.**
>
> **Listen to the advice of any man who can sell cars to the user. More than that, seek his advice, even ask for it and promise him immunity as a reward for his testimony.**
>
> **And the more sullen the dealer or salesman appeared to be, the more his advice would be sought. I would try to learn of every sore spot in his memory.**

Do the dealers have opinions?

Most certainly they do, and very frequently they are quite intelligent opinions. This may surprise some factory sales managers and advertising managers (more of the latter), but it is true and I know a good many successful sales managers who have the highest respect for dealer opinions. There have been some changes in selling and advertising staffs during the last few weeks that have been very interesting. Several men whose names and methods were recorded unfavorably in memory have sought new jobs.

It seems to be difficult for some men to learn that arrogance is not knowledge and that the show of arrogance does not often impress the other fellow.

But enough of this. The object of this article is to present to the manufacturers and their sales departments some opinions on a much discussed topic:

That of the changing of models.

Thirteen dealers have testified through a channel that was entirely friendly to them as to their best opinion on the merchandising side of the new model program. These opinions do not agree. That was to be expected. They do, however, indicate that a number of factories have treated their dealers fairly on this point. In fact, the factory record here is not nearly as bad as in other points on which these dealers testified. But the ideal is not arrived.

> **One interesting point is the outspoken opinion of several of these successful automobile sellers that the announcing of a new model is not a good merchandising point at all and that changes should be made entirely without the brass band accompaniment.**

Here is the question these dealers were asked to discuss:

> **When do you believe that models should be changed? Supposing you have on hand quite a number of cars and the model is suddenly changed, do you believe that the dealer should be given protection for those which he has been unable to move prior to entrance of new models?**

The first reply reads like the feudal system of government was in control of the automotive industry. Read it:

1—It is always bad policy to change models in midsummer. This makes the dealers stop buying and has a tendency to make the public stop buying, not knowing what is going to happen. This is especially bad when it comes immediately after having liberal shipments.

> **It is a well known fact that many manufacturers load up the dealers and distributers when about to change models and even though changes are not made, if the dealer does not take a certain number**

of cars, which would be impossible for him to sell, the factory will take the agency away from him leaving him with a lot of cars on hand.

This is also bad for the new dealer as well as the old inasmuch as the old dealer is often forced to sell at a low price in order to dispose of stock on hand.

I believe that models should be changed in any event about Jan. 1. Dealers should have an ample protection and ample notice of the change of models. Dealers should have at this particular time protection against decline in price where there is so much talk of depreciation of value.

—

The next two opinions are milder but point to the wrong:

2—Most of the standard car factories are not making any model changes and have not in the past two years. They have come to the conclusion that the series system is preferable. Make slight changes as they go along. I do not think that any reputable factory will change its model and leave the dealer hold the sack. They can never build up a real dealer organization with that policy.

Witness the Blank factory to-day. Their past sins are enough to keep the live one off of them. The factory that treats their dealers thus is composed of poor business men, and the dealer left in the lurch with old models on hand will gain if he ceases to do business with such concerns.

—

3—Model changes should be made Jan. 1, and first announcement at New York shows. Factories that wish to be square should protect their agents against change of models, unless plenty of advance notice is given that models will be changed. Too few factories give any consideration to distributer organizations but prefer to keep all distributers in the dark.

—

Now we will open the windows and let in some fresh air, for the next installment of dealer opinions indicates better thoughts about the factory. But they still are interesting:

4—The Blank people have always told us sixty days, at least, in advance when a model or a price was to be changed in normal times, giving us time to clear our boards and have our sub-dealers in the same shape.

During the present high cost of work, they have on all occasions, with the exception of one time, protected us as far as they could on all orders we had taken at the old price. This one occasion was entirely excusable and we distributers had to take our share of the loss.

I believe the manufacturer should notify the distributer and he in turn the dealers in advance of any change in model or price, and if the distributer or dealer has not been on his toes to move his product, he cannot consider that the manufacturer has not done all he could.

If the manufacturer does not notify the distributer, I should think that the distributer has a perfect right to use any means he could to get back at the manufacturer and to fight him to a standstill if necessary.

5—Dealers should be notified in ample time to unload. If over-stocked and they cannot unload, they should be given protection for cars they have been unable to move prior to entrance of new models. By notifying dealers sufficiently in advance of new models and not crowding or unloading on dealers, factories would receive the co-operation in disposing of all old models before new models come out.

—

6—I do not believe that any reputable factory would make any changes of model in mid-summer or at any time immediately following heavy shipments of previous models. Blank always makes its changes when the demand is at the very lowest point and so far it has protected the dealers to some extent on cars he had in stock. Another thing, it has always protected the dealer when there has been any reduction in price. Whether this will be done in the future, I cannot tell.

The factories would show very poor judgment in producing an entirely new model when the dealers were stocked heavily with the old ones.

—

The following replies are even more constructive than the last. These dealers have real opinions on this subject of such great mutual interest to the manufacturer and dealer. Read closely what follows.

7—Practically every factory has changed the very foolish method which prevailed heretofore of bringing out new models at regular intervals.

Practically all of them will pursue the plan of effecting improvements as they are perfected. In other words, as soon as a gear shift locking device is perfected by any factory, they will immediately be put into production without any statements as to changing models. Factories cannot expect distributers to operate on a large scale and carry a large stock, co-operate with them when production is large, unless they protect them in the event of a decline in price.

The fundamental principle of the business which has made it best for the manufacturer to set the resale price to my mind also makes it obligatory upon him to protect the distributer in the event of a decline.

—

8—I believe that the idea of changing models is soon to be a thing of the past. I believe the various manufacturers will arrive at a standard chassis and that such improvements or changes as they see fit to make will be made from time to time without advance notice or other schedule. In other words, as certain developments prove themselves, they will be incorporated into the standard product of the various manufacturers at any time of the year that the occasion may justify. This is my idea of the proper method of handling stock.

I know of several cases where dealers and distributers have bought very heavily to protect themselves against a price raise. It is poor merchandising to buy beyond one's reasonable requirements regardless of what the

Next Comes Contracts

IN this series of articles it has been the endeavor to point out that the dealer in motor cars really has the basis for a lack of confidence with the manufacturer.

The strongest argument in the dealers' discontentment has not yet been presented in these pages. It is the contract which—since this series was started—has been the subject of some discussion and which will be discussed more broadly within the next few weeks than ever before.

price situation is. A distributer or dealer is not justified in carrying more than a thirty or sixty days' stock at a time.

It is better to let a customer wait a short time for a car than to be over-stocked at all times. A little more old-fashioned conservatism in the automobile business would be a good thing.

When the factories intend changing models, they should advise the dealers and distributers a sufficient time ahead to permit them to get in shape for such change. As I remember, this has been the policy of the majority of the more reputable manufacturers. This condition will, undoubtedly, take care of itself as other injustices must.

Where a dealer is handling a product from a factory that has the reputation of being tricky, he should refuse to load up to such an extent that he is liable to be caught with an over-supply of obsolete models.

—

There is a real constructive thought in opinion No. 8, which follows:

9—I believe new models should be announced about August or September. The distributer should know in ample time so that he can clean up his old stock. If a distributer has a large stock on hand, the factory should co-operate to move these models before the new model is announced.

This could be done by having each distributer send a detailed inventory to the factory about six weeks prior to the time the new model will be announced. The factory could check up and see which distributers are overstocked and distribute these models to other distributers who may be sold out and short of cars.

The factory should reimburse these distributers to the extent of carrying charges for the cars which they move for him to other points. By carrying charges, I mean interest, storage, handling, loading and insurance charges. That is, the distributer in New York who might receive automobiles from St. Louis whose regular charge from factory to New York is $80 per car, and if the charge from St. Louis to New York is $100, the factory should reimburse the distributer for his freight charges and refund the New York dealer $20.

—

10—Models should never be changed radically. To deliberately design a new car, engine, body and so forth is wrong in principle as it depreciates the owner's investment and harms the selling organization. No one objects to improvements and the factory should refine its product wherever it would mean service.

Radical changes are not necessary in the automobile from the standpoint of better operation.

As many or more people will buy another make through being offended at having their cars put out of date over night, than will buy the newer model to be abreast of the time.

If models are to be changed, there should be some protection. The last of the old models should be placed in the dealers' hands on about Nov. 1 and the first of the new models shipped after Jan. 1.

—

The three opinions that follow set forth a different view, but they are none the less interesting.

11—In this part of the country, we have a rainy season when the North is having winter. As a suggestion for time for changing models, I believe Jan. 1 of each year would be fair to all. When models are changed, the dealer certainly should be protected on the old style model, because if his customer does get an old style car, figuratively speaking, he never forgives the dealer who "put it over him."

12—The change of models in this territory and in the summer has not affected us very much as there has not been any dealer in this territory who within the last few years had enough cars in stock to affect him materially, but I believe that where a dealer has a lot of obsolete models in stock the factory should furnish him the parts to bring this model up to practically the same standard as the new model. The manufacturer knew he was making a change when he loaded up the dealer.

—

13—With the revamping of conditions we are now going through, I am expecting that only the sound, well managed distributer organization and dealers will remain and those kind of people are entitled, and I am sure, will get the proper kind of consideration from the factories in relation to the condition of the merchandise they have on hand in contemplation of a change of models or prices by the factory.

The factories we are doing business with, I feel confident, realize the necessity of being in proper accord with their dealers and distributer organization and always will have the welfare of their field organizations in mind when making such important moves as changes in models and prices.

The manufacturer who does not value the members of his firing line sufficiently well to take them into consideration to the above extent will not be able to do business with responsible field organizations. Wise manufacturers realize the necessity of protecting to a reasonable extent their distributer and dealer organizations.

—

It is our belief that these opinions are worthy of the consideration of the factory executive.

Study of Starting and Lighting Battery Characteristics

IN connection with the preparation of specifications for starting and lighting batteries requested by the Motor Transport Corps of the Army, the Bureau of Standards has made a brief study of the performance of these batteries in the operation of a few of the various types of automobiles; the experiments having been made on cars in ordinary running order. Performance curves showing the instantaneous demands upon the batteries when cranking the engines have been obtained by means of oscillograph records, these records showing characteristic differences typical of the design and condition of the various engines and starter systems. The initial values of current and voltage, which cannot be obtained by the use of ordinary indicating instruments, are shown at the time of closing the starter switch. After the starter has begun to turn, the current decreases rapidly, pulsating with the compression of the successive cylinders. The results which have been secured are to be regarded as suggestive rather than quantitative measurements of performance. They indicate the possibility of using this method for the study of problems relating to lubrication, ignition, compression, and distributer action. In addition, an exact method is secured for measuring the speed from one revolution to another. The characteristics of the charging current when the engine was running were also studied. Measurements have been made at different speeds, different throttle openings, and different temperatures.

Important Factors in Development of Foreign Trade

A visitor remarked the other day that we seemed to keep very close to fundamentals. Of course we do. Any study of the foreign field will reveal that American manufacturers neglect fundamentals. They can succeed only on proper fundamentals.

By George E. Quisenberry*

IT can be said that the coming months will test out the abilities of the American automotive manufacturers as foreign traders. The markets of the world have been ours for several years; whether we shall keep them remains to be seen.

But in the commercial fight that is certain to come we have several distinct advantages.

FIRST—The ability to manufacture more efficiently and on better production methods than any other country; SECOND—Our knowledge of advertising; THIRD—Our ability to provide adequate service.

In each of these considerations the automotive manufacturers are world leaders. The problem now is to transfer them from the domestic to the foreign field and to use them in holding and extending our overseas trading.

The upward trend of exchange during the past few weeks has greatly heartened our exporters. With sterling leading the way, the currencies of almost every country have gained in value materially in the present movement and, with few exceptions, the buying power of foreign money is greater to-day than it was a few months ago.

This is one great advantage in favor of a reopening of foreign trading. But exchange, unfortunately, is something that the manufacturers themselves cannot control and cannot, by their own efforts, so effect that it will redound to their advantage. What they can control and what should be before them now, more strongly than at any time since the automotive industries first reached out after overseas business, is their sales and service policies. Here are the factors under which the individual exporter and manufacturer must stand or fall.

This article proposes to take up some of these things. Among them are:

1—Subjects as sales and service literature, 2—Campaigns for highway improvement, 3—Participation in motor shows and agricultural demonstrations, and 4—Above all, sales methods which meet the foreign buyer on his own ground.

Of seventy automotive concerns manufacturing and selling all lines of equipment, a recent survey showed that fifteen only could provide foreign language literature for their products. Yet, each of the seventy was interested in foreign trading and is trying to obtain export outlets.

Service

What would be revealed in a similar survey devoted only to service and maintenance literature can only be imagined. One company, for example, which has placed its cars throughout the world, was unable recently to find a wiring diagram showing its models equipped with magneto ignition and it had not thought of the necessity of furnishing any diagrams at all, except in English, to its foreign distributers.

Service, in the export field, is even more important than at home. But this subject has been discussed numerous times and further reference need not be made to it, except the statement that future developments should stress this more strongly than perhaps anything else. The well-serviced car will be the one with the greatest sales in foreign countries and the exporter who devotes the proper attention to maintenance and upkeep will find himself amply repaid in increasing business and expanded profits.

For the coming year, the automotive exporter must keep himself in the markets. During a period of depression, this may be more or less of a thankless job, but one he must go through. Otherwise, when he attempts to regain his former standing, undoubtedly he will find the market closed. Those companies which have been longest in the foreign field are not abating their efforts in the slightest. One export company, notable among the American sellers of passenger cars abroad, has even increased its sales and advertising departments during the last month. Its traffic and accounting departments may employ fewer men than they did six months ago, but the sales and advertising divisions are stronger to-day than they ever were. That company means to keep the markets it has gained; it has confidence in the future of the automobile throughout the world.

Shows

In the next six months numerous shows and demonstrations have been arranged. Although few manufacturers would allow any of their dealers to keep out of any domestic show, regardless of the size of the place in which it is held, they have generally paid little attention to foreign exhibitions. A show is scheduled to be held in Mexico City in March. The Witwatersrand exhibition in South Africa was so successful last year that it will be repeated again in the same month and, following in April, May and June, at least eight or ten agricultural exhibitions will be held in different places throughout the Union. Some of these will be small, but each is a potential sales place for cars, trucks, tractors and other equipment.

A calendar of coming expositions shows many others, such as the Lima centennial exposition and the Indian tractor trials. Some are out and out motor car shows and others are the annual exhibitions of district or national agricultural societies. There are many of these societies

*Managing Editor El Automovil Americano.

in Latin-America, Spain, South Africa, Europe and elsewhere and most of them hold an annual exposition or fair. Even Bulgaria is planning a forthcoming exhibition, and extensive tractor trials, under governmental supervision, are to be held in India.

Naturally, the American manufacturer should be a leader in the promotion of the show idea. Outside of Europe and a few of the larger centers, the exposition plan has not penetrated far in the overseas territories. But it has been a business builder in the United States and it likewise will be a business builder in other countries.

Highways

The promotion of road building is an opportunity that but few makers have even considered. In the more undeveloped territories of South America, Australia and South Africa, and the Far East, there is already a great deal of road interest and it only needs a push to start the improvement of a large mileage of highways, with a resultant gain to the automotive industries that will dwarf all the difficulties and costs of the campaign.

In fostering foreign road campaigns, particularly in South America, the first thought needed to be put across is that the macadam, concrete or asphaltum road is not the only construction for solving communication problems. Many communities are holding back any highway improvement until they can have the best. But the automotive industry certainly knows what has been done in our own Middle West with the graded dirt road that may be improved at surprising small cost.

The graded dirt road will answer many of the needs of Latin America. It can be quickly and easily built at small cost and with widespread benefits. But it must have a champion and that champion should be the automotive exporter. Where roads do not exist at all, as in many parts of Argentina, Brazil, Chile and elsewhere, some sort of a highway should be cut through between the different cities. If these are graded and properly drained there are roads suitable for traffic nearly the entire year.

The problem in the Argentine is merely one of rain and drainage. Three-fourths of the country is without stone and is level and flat. Many of the provinces have no frost, and thus one of the major enemies of good roads is removed. The ease with which roads can be improved in such districts certainly should cause exporters to bend every effort to further highway projects.

American Cars

The American car lines are stronger to-day than they have ever been before for going after foreign business. The New York show dispelled any doubts that may have been entertained on this subject. The almost universal betterment of finish and workmanship and the more careful manner in which the cars were built should prove an important step forward in the export trading of American manufacturers. The cry against the American-made products has been that they were poorly finished, that colors were badly put on, that upholstery was inferior, etc. Perhaps there was some merit in these contentions when they were first made, but they should no longer hold. Now that the market has been turned into one in which production is not the only problem, the cars themselves should certainly disprove any such statements. The show revealed that more careful assembly and inspection had become the rule and it also showed that the manufacturers were ready to go further in meeting the demands of the individual customer.

Certain of the foreign markets have their individual requirements in such details as color and finish, ignition, steering, etc. Manufacturers are offering more color options to-day than they did a year ago; in fact, many companies announced themselves ready to furnish any color wanted. The number of makers refusing to fit magneto ignition and right steering is smaller than it was a year ago. Wire wheels were shown on a larger number of models—and wire wheels are desired equipment in many places.

All of these options, which have nothing to do with anything except the individual wishes of buyers and are not determined by the excellence of one kind of equipment over another, indicate that our companies are better prepared for the foreign trade fight that is to come. And it will be a fight, particularly on the higher priced cars. These markets can be held only by salesmanship of the highest type. Service, undoubtedly, will be the backbone of this salesmanship and next in line with it will be the attempt to give the buyer what he wants. He is, after all, the deciding factor in any business transaction and his wishes rather than those of the sales manager, the vice-president or even the president should be respected. That is sound salesmanship, in the foreign as well as the domestic markets.

To illustrate: One of the larger companies brought out its 1921 line early last fall. As its foreign business is large, its distributer in one of the Central American countries was immediately sent a shipment of the new models. The first cars sold readily, as the line was one of the larger sellers in that particular territory. Then sales stopped. The investigation which followed revealed that the tops did not stand up under the hot sun of this Central American country. The composition material became sticky under the heat and the Central American buyers did not like them, although they are entirely satisfactory in the home climate. The job itself was one of large production and to furnish different tops for the hotter climates puts the company to quite an expense. But the adjustment was made and the buyers of this particular car in the warm countries will not have to worry again over the durability of their tops.

This was good business. If the change had not been made quickly, the line would have lost an attractive market. But, judging from past events, how many manufacturers would have seen the wisdom of such an adjustment?

Mechanically, then, the American car lines—and likewise trucks, tractors and accessories—are suitable for all markets, or can be made so, if the manufacturer has the proper conception of building up his overseas trading. What are the other drawbacks to immediate business?

Cars in India

A BRITISHER just returned from India has been drawing attention to and indorsing the remarks of the newspaper *Englishman*, of Calcutta, on the big hold of American cars in British India. The figures quoted are from the Department of Statistics of India. They show that 1041 motor cars were imported into British India during September last, and of these 723 cars were consigned from the United States and 247 from the United Kingdom. During the six months April to Sept., 1920, the number of motor cars imported into British India was 7498, against 2553 cars in the corresponding period of the previous year. *Of the* 7498 *cars above referred to,* 5654 *were from the United States,* 1002 were manufactured in the United Kingdom, Canada recorded 532, France 49, Italy 43.

The increase in the imports for the six months of 1920 over the same period in 1919 is striking, and would indicate the rapidity with which the car is replacing the horse for vehicular traffic. A striking feature also is the poor show the imports from the United Kingdom make, and the relatively good position held by Canada.

Transmission Efficiencies

Editor AUTOMOTIVE INDUSTRIES:

The writer was very much interested in reading the above editorial, which appeared in the Jan. 6th issue of your paper.

The writer has been conducting extensive tests in the laboratories of the Joseph Dixon Crucible Co. with truck transmissions to determine the efficiencies of various lubricants, and the results obtained have been such as to confirm the results described in the paper recently presented to the American Society of Mechanical Engineers.

The tests conducted by the writer were such as to preclude, as much as possible, any errors in observation, since each test was repeated several times, and both the electrical and mechanical readings were employed as a counter-check.

Two different types of transmission were used in the tests conducted by the writer—one, a heavy truck type, which was apparently identical with the one described in the A. S. M. E. tests. This transmission is of a conventional design, with the constantly meshed gears located at the forward end of the transmission and the secondary shaft is arranged in the same horizontal plane as the primary shaft. The other transmission tested by the writer was a lighter truck type, with the constantly meshed gears also at the forward end, but with the secondary shaft below the primary shaft.

It was demonstrated in both cases that the direct drive is slightly less efficient than any of the lower gears, whether the secondary shaft is located in the same horizontal or the same vertical plane with the primary shaft. The difference, as may be expected, was slightly more pronounced in the two shafts in the same horizontal plane, but it was very clearly demonstrated that the greatest proportion of the power losses is due to the churning of the lubricant.

It is, of course, evident, that the churning effect of the secondary shaft is identical whether running in direct drive or in low gear, but the fact that the remaining gears of the primary shaft, except the constantly meshed gear, are running at lower speeds when in low gear, will readily account for a difference in the churning effect. This is due to the fact that all the gears of the primary shaft are running submerged in the lubricant to about one-third of their circumference, since the normal filling of the transmission case has to be approximately to a level flush with the underside of the primary shaft. If the level of one lubricant is below this line, it would be difficult to properly lubricate the anti-friction bearings employed.

In order to check the perhaps unexpected results of the extraordinarily high power losses, due to oil churning, a number of very interesting experiments were conducted by the writer with the lubricant drained from the transmission with sufficient lubricant clinging to gear teeth and bearings to prevent damage during the test runs. The results obtained showed very clearly that the power losses under these conditions were only a small fraction of those run with the case filled with oil. The data obtained, together with those of other tests, have made it possible to determine fairly accurately the effects of the different elements which contribute to the power losses in an automobile transmission.

The value of the test observations was enhanced by the fact that test runs were made at different temperatures, and, as was to be expected, the effect of the churning resistance of the lubricant at lower temperatures was particularly noticeable.

The writer feels that it would be of interest to you to be informed at this time of the results of his tests, which will be presented to the Engineering Fraternity in complete form as soon as some final check tests have been completed and the very extensive material has been properly digested and interpreted.

I should appreciate very much to receive your advices as to contradictory results of previous experimental evidence, but I believe that such evidence is not very conclusive in view of the fact that the majority of previous transmission tests were not conducted under the strict scientific precautions which conclusive efficiency tests require.

It is the writer's opinion that a thorough examination of the present transmission designs will demonstrate very clearly that there is considerable room for improvement in the design of our present type transmissions, especially from the standpoint of satisfactory lubrication.

G. A. UNGAR.

Smaller Engines to Better Fuel Economy

Editor AUTOMOTIVE INDUSTRIES:

I was very much interested in reading your editorial in the Jan. 20th issue on "Effect of Weight on Fuel Consumption." I believe that the last sentence in your editorial strikes a keynote, and which is a thought probably apart from the rest of the story, in which you state, "The chief reason why the light car consumes less fuel than the heavy car is due to the fact that a smaller engine can be used."

I believe that we should all work toward smaller engines, in order that we can obtain the best possible efficiency out of our power plants. We are all aware of the fact that the Otto Cycle is very inefficient at light load, and only shows real results when operating at, or near, full throttle opening. A comparatively small engine can be used if we decide that high speed can be sacrificed. Forty miles an hour should be fast enough for the average person. With a small engine, geared so as to give this as the highest speed, instead of sixty or better, we will be operating the engine at nearly full throttle a greater portion of the time. We might have to sacrifice slightly in acceleration ability, but refined design can combat this to a large extent.

The problem of manifold distribution is most serious at partial load while the full-throttle opening condition can be easily coped with. We find that trucks with a

(*Continued on page* 282)

The Relation of Cost of Labor to Factory Product

The marked need of stable definitions of labor cost, also of more intelligent compilation of cost data before adjusting sale arrangements on this basis are here set forth. At present, efficiency of labor does not figure in results. All factors included in labor cost must be determined.

By Harry Tipper

THERE is a great deal of misconception even among the heads of industrial concerns about the cost of labor and its relation to the total cost of the product. In this case, of course, labor is used to indicate the labor employed in production, it does not include the labor necessary for office work, sales executives and other departments of the business not concerned with the actual production effort.

A great deal of loose conversation has been made in and out of publications, and in and out of committees in various industrial establishments. Orders have been handed to production managers from the final heads of concerns instructing such managers to put into effect a reduction of wages on the basis that it would provide a reduction in costs on a given proportion without having first examined the proportionate amount of production labor required in relation to the total price of the product.

In one concern where the production manager has gone through various experiences with cost accounting and arrived at a system of cost analysis which appears sufficiently accurate and informing, **this manager was instructed to reduce wages ten per cent because the product had been reduced ten per cent in its price. He had the matter looked up and found that the effect of a ten per cent cut in the wages was equal to a one and one-quarter per cent cut on the sales price of the article.**

The actual amount of factory labor required in the production of a given article depends upon the character of that article, the character of the machinery and equipment involved in its manufacture and the character of the process.

It is true that in connection with all industry and using the term labor in its broader sense a very considerable portion of the final cost is taken up by the cost of labor, but this does not obtain when the term labor is used to discriminate factory labor, as is quite customary, and when single industries or establishments are dealing with their own particular part of the labor problem.

A number of the statements made by otherwise responsible men in industry handling matters of considerable importance either from the financial or production end, indicate the superficial character of the study which has been given to the subject of labor costs and the division of those labor costs in the departmental activities of the company involved. It is rarely the case that the cost of the labor in the factory per piece amounts to more than 40 or 50 per cent of the total sales price of the product.

The total labor required for the final sale of the particular article, including the manufacturing labor, the labor involved in designing, planning, accounting, office routine, demonstrative overhead and sales may reach very much larger percentages of the amount involved in the sales price of the article.

Many manufacturers have spoken as though the reduction of a given per cent in the price of their manufacturing labor would permit a similar reduction in the sales price, although obviously the labor percentage is only a proportion of the total and may reduce that proportion cost by half the percentage reduction in the sales, one-quarter, or in some cases one-tenth.

It is somewhat idle to discuss the exact effect of an increase or a reduction in the wage rate as arising out of a necessary reduction in the sales price, until the cost of that proportion of the labor affected is determined in terms of the sales price itself, and this is particularly the case when the efficiency of the labor is not considered at all in connection with the reconsideration of the rate.

This is just an indication of the amount of practical work required in the analysis of cost in order to arrive at a proper understanding of what is involved in the actual pay-roll pertaining to the different process of manufacturing and selling a given article.

In some products, where the cost of the product itself is very low and the labor required to handle is small, a very large proportion of the sales price may be the cost of selling, packing and physically distributing the product in question. In this case, a reduction in the amount of pay for the workers in the factory would have to be absurd, in order to meet a small reduction in the cost of the article itself.

In some special articles the value of the product is less than 5 per cent of the total sales price, the value of the package represents about 45 per cent and the value of the labor in manufacturing only 10 to 20. A reduction of 10 per cent in the sales price in this case would require a reduction of 50 per cent in the manufacturing labor rate in order to equalize the cost variation.

No solution of the question of labor costs can be secured from examining it from this standpoint alone, and certainly no solution can be determined by the arbitrary reduction of wages without the proper understanding of their relation to the cost of the product to the buyer.

This brings up again the question of what is involved in the labor cost, and what relation it bears to the labor rate which is paid in the plant. It also involves the question of what is meant by labor. This word is used to describe many different sections of the labor necessities included in the manufacturing establishment. It may be

used to indicate the total labor required outside of those officers of the corporation who are elected by stockholders. It should be used to include all labor involved in the manufacturing and sale of the article no matter whether the labor is executive or subordinate, or whether it is mental or manual. It is most frequently used, however, to describe the more or less manual labor included in the manufacture or the actual production of the articles which are made by the factory and which come under the variable wage scale.

The confusion which exists in the discussion of labor costs arises very largely from a lack of definition as to that operation of labor which is being referred to in the discussion and the relation which that part bears to the total labor costs involved in the particular establishment.

The conditions surrounding the manufacturing process in the particular establishment are rarely indicated in connection with the discussion of labor costs, and therefore the reasons for their importance or lack of importance are not made a part of the discussion itself, and cannot be considered in drawing conclusions therefrom.

The subject is one which is discussed so frequently in public and semi-public prints or meetings, that the indefinite character of the discussion is particularly unfortunate. As a matter of fact, the analysis of costs has not gone sufficiently far in its consideration and definition of the items under which the costs should be placed, and the proportionate importance of the labor in connection with such costs. In very few cases is the analysis between manufacturing costs and distribution costs clearly determined, and frequently there is little attempt to differentiate between the accessory costs to manufacturing not included in the actual production, but necessary to the production and the accessory costs to distribution and marketing not involved in the direct operation, but required for the completion of the operating necessities.

The cost analysis which has been considered and developed in a great many lines of business has been limited in its scope as a rule, and has not been of sufficient value to the manager and engineer who are concerned with determining not only the amount per unit, the effect of the variables per unit, but the accessories, the comparative importance of all the different elements necessary to the completion of the production or the accomplishment of the final sale.

The discussion of the cost of labor has not dealt with the average efficiency of the laborer at the time that the cost was determined, the effect of the variation in the efficiency upon the cost, the relation of the total cost per unit to the variation in the hourly rate and other matters which would be considered absolutely necessary in determining values of material or equipment.

There is so much misunderstanding already on the subject of labor costs that only careful definition of the particular cases involved will lead the discussion into more practical considerations of the subject, the factors which must be considered in its operation and the relation which it bears to general prices, in the particular cases which are being considered.

At any rate, the present loose and indefinite discussion does not help the solution of the situation and merely adds to the confusion by increasing the misunderstanding.

Selling the Sales Force to the Workmen

SEVERAL hundred salesmen of a Western automotive concern gathered for convention at the factory—salesmen representing the "pacemakers" in the sales force. While these men were holding their meetings and gatherings of one sort and another each was given a badge which he was told to present to a certain workman in the shop. Each salesman met a specified worker or group of workers and these workers took the salesmen through the shop and explained the plant activities and working processes.

On the face of it, this was solely for the purpose of familiarizing the salesmen with the plant. But it had a much deeper significance. It was, in fact, an effort to "sell" the sales force to the factory.

In many plants the workers are utterly unfamiliar with the things that the salesmen do. This plan was devised by the S. F. Bowser & Co., Inc., to overcome such a condition. Workers are apt to think that selling goods is a snap job; that a salesman needs merely to go around and take orders. And they may also feel that they alone could run the plant and distribute the goods without the aid of executives or salesmen. Consequently, there was a distinct educational value to these workers to find out just what is required of a salesman and just how hard salesmen have to work in times like these when business comes with difficulty.

In the Bowser plant paper is a department headed "Our Inquiring Reporter." In this particular issue the inquiring reporter asked a number of employees "What do you consider your most interesting experience since being employed at Bowser's?" This is the answer given to this question by Eugene Wells, an employee in the plant working in department 14:

"The sales convention was one of the most interesting occurrences since my coming to Bowserdom. It was at that time that I was seriously impressed with the fact that we in the shop are utterly dependent on the sales force and they on us.

"At that time they wanted us to 'hurry up' production to fill all the orders they could sell, and now that the much-talked-of after-war readjustment of prices is upon us, it is incumbent upon each of us to 'hurry-up' production as much as possible in order to cut down unit cost and thereby enable the salesmen to make sales that they might not be able to make at war-time prices, and incidentally keep the wheels turning here in the shop and all of us on the job as usual."

Smaller Engine to Better Fuel Economy

(*Continued from page* 281)

load gives greater ton-miles per gallon of fuel than do passenger cars. We also find upon analyzing the exhaust gases of trucks, that more complete combustion is obtained. These results are due to the truck engine operating at full-throttle the greater portion of the time.

The obvious conclusion is to endeavor to control these favorable conditions that we know of and the answer is the use of the small engine. AUSTIN M. WOLF.

A TEXTBOOK of rather elementary character dealing with ignition systems used on automotive vehicles has recently been published by the McGraw-Hill Book Co. under the title Automotive Ignition Systems. The authors are E. L. Consoliver and G. I. Mitchell.

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Minimizing Starting Difficulties

MUCH attention has been paid in recent years to various methods of heating inlet manifolds as a means of securing better vaporization of fuel, and it is now quite generally conceded that even the high end-point fuels now available can be successfully handled by this means. During the starting period, however, no exhaust heat is available. A choke or primer is usually employed to furnish a great excess of fuel in order that a sufficient amount of the lighter fractions to form an explosive mixture at low temperatures may be had. Only a small part of the raw fuel drawn into the cylinders is vaporized and much of the remainder finds its way past the pistons to dilute the lubricant in the crankcase. The detrimental results of this dilution are well known, and the waste of fuel is appreciable though small in comparison to other fuel waste to which we have unfortunately become so accustomed.

There are two means of pre-heating available. A small amount of fuel may be burned in such a way as to heat the inlet passages, or an electric heater can be installed which will at least partially vaporize the fuel used during the starting and warming-up period. If fuel is used for pre-heating it must be ignited by a spark, hence electrical apparatus and more or less other complications are added to a system already complex. Nevertheless, the problem is worthy of more study than it has been given, and it should be receiving study for the troubles incident to dilution of lubricant, and the difficulty of securing a quick start seem certain to increase as fuel becomes less and less volatile.

When means of properly heating the charge once the engine is started are provided the actual start can be greatly facilitated by the use of a small quantity of very volatile fuel such as ether as an alternative to other aids in starting. This involves the use of a relatively simple priming device, and may prove the best solution of the problem. Priming should, however, be used so far as possible without resort to the choke if the evil effects of lubricant dilution are to be avoided.

An incidental but by no means unimportant benefit to be derived from any method (except the use of an electrical heater) that makes for prompt starting is the lower demand that will be placed upon the battery. This constant source of difficulty can be made less annoying by anything that tends to keep the battery fully charged—an argument which does not, of course, favor the use of purely electrical means for aiding starting.

Speak for Economic Government

AN increasing number of automobile and truck manufacturers are becoming interested in export trade. To these manufacturers the figures showing the extent of this trade, issued monthly by the Federal Bureau of Foreign and Domestic Commerce, are of intense interest. It will probably be very interesting to these manufacturers to know that the issuance of these figures is endangered because of a lack of money to maintain the photostat department which prints the data. It also should be interesting to automotive manufacturers to know that the Patent Office is steadily losing its best men because they can earn several times as much as their Federal salaries in private work. This great and useful office is far behind in its work; its records are poorly kept and there is no remedy under the present system of appropriations. The fact that the Patent Office is self-supporting apparently has no influence on Congress. The receipts of the office are turned into the United States Treasury and the Commissioner of Patents must beg for appropriations, just as do the heads of non-productive bureaus.

Of course, we are all for economy in governmental affairs. But economy does not always consist in not spending money. It is the wise spending of money that should be sought. These two bureaus of the Government are useful and necessary institutions. They are worthy of support.

It would be a very wise precaution for manufacturers to write to the members of Congress from their states demanding support and economic man-

agement for the useful functions of the Government. There are other very worthy Federal institutions, among these being the Forest Products Laboratory to which we referred on this page a few weeks ago, and the Bureau of Standards.

It is surely a duty of the engineer and manufacturer to speak out on these things at this time. Write your congressman and senators to-day and we venture you will be surprised at the nature of the replies you receive.

Helps Patent Office Service

THE Conference Committee of the Senate and House of Representatives has recommended for favorable action House Bill 11984, known as the Nolan Bill. This bill carries an upward revision of the salaries to be paid to employees of the Patent Office, the intention being to make it possible for this office to hold some of its men longer than at present.

The bill, as recommended for passage, fixes the salary of the Commissioner of Patents at $6,000 a year. This office, besides being that of the executive of the Bureau, is often compared with that of a judgeship. The Commissioner sits as judge in patent hearings, which are the equal of many cases tried in the regular courts.

The passage of this bill undoubtedly would be a forward step for all of those interested in patents. It means a check in the present expensive labor turnover in the office—this turnover being expensive to all who are financially interested in patents. The time remaining at this session of Congress for passage of the bill is very short. If you are interested in improving patent office service, write to-day to the Congressmen from your district asking them to call up this bill and to support it with their votes.

There is a great need for this legislation.

Power and Moral Obligations

THE argument against any sort of democratic control in industry is largely based upon the lack of efficiency which would probably result. But the argument in favor of the present form of control through benevolent, or some other form of autocracy, rests almost entirely upon the assumption that the power in the hands of employers will for the most part be so utilized and administered as to operate industry for the best interests of society and in such manner as to render the best service to the community.

Consequently, the responsibility of each individual manufacturer to so administer the part of industry under his control is great. It presents to him an especially difficult problem for practical solution when business conditions are unfavorable and there is a strong temptation to disregard for the time being those moral obligations upon which the interdependent units of modern industry fundamentally rest.

There is a certain obligation that every manufacturer owes to every other manufacturer. Without a widespread conception of this moral basis of industry, business and manufacturing cannot successfully go on. Not long ago a parts maker wrote to one of his customers, stating the difficult position in which he was left by indefinite suspension of orders and calling attention to the necessity for recognizing the moral phase of the situation in endeavoring to formulate some plan by which an adjustment might be made which would be fair to both parties.

The reply to his letter ran something like this: "We have looked at our own situation and the situation with us is precisely the same as it is with you. Our customers have backed up on us. We in turn back up on you. You in turn back up on your material supplier, and so it goes." And the reader might be justified in reading the writer's thoughts to add, "And devil take the unfortunate company that has no one else to back up on." Were this idea to prevail, modern industry could not survive successfully, because it is made up of strongly interdependent units which must recognize toward each other certain fundamental moral obligations.

In like manner, there is a similar obligation between employer and employee. The economic power in the hands of the employer, which is especially strong just at this time, needs to be wielded in a just and calm manner. Where wage reductions are necessary, they should not be in the form of reprisals. It is at a time like this that the real test of the essential soundness of our present industrial system is made.

The China Famine Fund

IT has been suggested that the business papers should suggest to readers the great need of millions of Chinese for food to avert an unprecedented death percentage in that country.

This movement is not a part of the Hoover movement for feeding the children of Europe. The need in China is based on bad crop years, due to drouth and other features over which man has no control. There can be no question as to the need.

No question as to whether any man should share his plenty with others should arise. If you can spare something from your means, it is your duty to help others. If you care to justify any gift of this sort by economic arguments, think of the economic value of a human life, also of the trade prospects of a friendly China with her millions of people. The treasurer of this fund is Vernon Munroe, Bible House, Astor Place, New York.

A REVISED code of ethics was adopted by the American Society of Mechanical Engineers at their recent meeting in New York City. The second item in that code is worth the attention of every manufacturer and executive. It is as follows:

"His (the mechanical engineer's) first duty is to serve the public with his specialized skill. In promoting the welfare of society as a whole he advances his own best interests as well as those of the whole engineering profession."

In this brief quotation is contained an excellent statement of the modern conception of the basis and purpose of industry.

Chicago Show Starts Midwest Trade

Sales Approximate Two-thirds of 1920

Attendance Records Show Wide Public Interest—Rural Buying at Minimum

CHICAGO, Feb. 5—The New York automobile show established the fact that the buyer had returned to the market. The second national show held in Chicago during the past week further proved it. Shows which have been held in other cities in the intervening time likewise bore evidence of it. With reference particularly to Chicago, buying has returned where little real business has been transacted for the past two months and it has returned with great enough vim to lead the dealers to believe that with continual, effective pushing it can be carried on through the year.

From every standpoint of the distributer and dealer the Chicago national automobile show was a success. While the actual retail sales made on the floor were not as great as during the same period a year ago, reaching possibly 66 2/3 per cent of that figure, the great attendance and the unusually large number of live prospects obtained fully justified the optimism which the selling organization felt from the time the doors of the Coliseum and First Regiment Armory opened until they closed a week later.

The paid attendance, despite unsettled weather conditions—a few days of rain and other days that were threatening,—was 18 or 20 per cent better than last year. With the exception of the opening day practically all admissions were paid. The booths were so crowded the middle of the week that it was impossible for the selling organization to do really effective work.

Prospects Increase 50 Per Cent

In estimating that the list of prospects is far greater than during the same period in 1920, perhaps 50 per cent greater, there is taken into consideration only those prospects who showed a real interest. Dealers doubtless will find as has been the experience at other shows that one list will probably contain the names of prospects whose names are possibly on half a dozen other lists.

There were comparatively few buyers or prospects, as compared with last year, from the rural districts embraced in the Chicago distributer's territory. The number of country dealers showed a slight decrease. Dealers who did not come have fallen into the state of mind revolving about depressed conditions at home. Selling campaigns will shortly be projected by Chicago distributers to bring the dealers in the country to a different way of thinking.

Distributers feel from the out of town attendance of prospects and dealers that business in the agricultural states inclusive of Illinois will continue to remain in a quiescent state unless real merchandising efforts are brought into play. In spots there already appears to be an easing up among the farmers. Financial pressure by the banks is likely to cause grain selling soon.

(*Continued on page* 290)

Car Demand Steady in New York District

NEW YORK, Feb. 5—Metropolitan dealers find much encouragement in the steady tone of the market at the close of the first week of February.

There is every indication that the selling momentum gathered in the New York show, early in January, has been lasting and that a gradual increase in buying may be expected for the next few weeks.

Particular significance is attached to the fact that business in general along the row is nearly 100 per cent better than last October and November and considerably better than December, and it is pointed out that in addition to this the "spotty" business of January has settled down to a steady demand for cars day by day.

Wellborn Sees Return of Trade in South

ATLANTA, Feb. 5—That business has already greatly improved since the first of the year, inflated credit reduced, and is assuming a stabilized condition, and that the present outlook portends better and brighter times for all lines of business throughout the South, is the opinion expressed here in an interview by M. B. Wellborn, governor of the Sixth District Federal Reserve Bank.

The opinion is based on a survey of conditions made by the bank officials of the Southeastern states comprising the Sixth Federal Reserve District. Wellborn stated that the deflation period has about passed and that normal conditions are gradually returning.

GRAY-DAVIS SELLS LIGHT

BOSTON, Feb. 7—H. C. Dodge, Inc., has become the owner of the house lighting system formerly marketed by Gray & Davis, Inc. This plant is known as the "D-Light House Lighting Unit," and the company expects to manufacture under conditions which permit a larger volume of production under the supervision of a staff of engineers and high-grade mechanics.

Tire Dealers Form New National Body

Cleveland Selected as Headquarters—Seek Co-operation of Manufacturers

CHICAGO, Feb. 5—The National Tire Dealers' Association has been organized here following a three days' session of delegates from ten cities where local associations have already been established. Cleveland was selected for the national headquarters and Phillip O. Deitsch of that city was appointed secretary.

The purpose of the association, according to the constitution, is to advance and safeguard the business interests of tire dealers and to promote a co-operative relationship between the manufacturer, tire dealer and buying public.

A resolution was adopted defining the legitimate tire dealer.

"Whereas," it says, "we believe that the policies of a great many manufacturers have been unethical with reference to their interpretation of legitimate tire merchants, therefore be it resolved that this association consider a tire merchant to be one who sells tires at retail and whose policies are not dictated by any manufacturers. The definition of a tire merchant shall be as of firms having a permanent place of business, making their major profits from the sale of tires, tubes and tire accessories; also repair men and vulcanizers and such owners of garages who carry a stock of tires and tubes for resale."

Another resolution was adopted relating to the mutilation of used tires.

Would Stop Tire Frauds

"Whereas," it reads, "it is the practice of some unscrupulous tire dealers to repair and replace upon the market worn-out tires, be it resolved that this association recommends that its members mutilate by cutting in two all junk tires just before disposing of said tires to anyone so as to render them unfit for further service."

Another resolution was passed recommending that manufacturers take some similar action.

The officers elected were as follows: President, Thomas F. Whitehead, Chicago; vice-president, R. F. Valentine, Cleveland; treasurer, Henry Stenzel, Milwaukee. The directors in addition to Messrs. Whitehead, Stenzel and Deitsch are Edward P. Farley, Minneapolis, and A. B. Clark, Kansas City, for one year; Joseph Roberts, St. Louis; R. J. Walters, Baltimore, and R. R. Woolley, Cincinnati, for two years.

Protests Stir Anti-Dumping Action

Propose Sales Tax to Equalize Prices

Revision of Internal Revenue Act Shown as Way to Correct Uneven Competition

WASHINGTON, Feb. 7—Nation-wide protests against the dumping of surplus trucks, sold by the Army to foreign dealers, on American markets have brought about a proposal to amend the internal revenue act at the next session of Congress in order to afford protection to domestic dealers and manufacturers. Congressional leaders believe that this unfair competition may be checked through the enactment of fiscal legislation which would impose a sales tax on trucks and other automotive equipment sold by foreigners or their American agents, to equalize the excise and sales tax levied on local manufacturers and dealers.

The California delegation in Congress has been advised that the Slough Trading Co., an English organization, has taken advantage of customs regulations which permits entry of American-made goods free, to invade the market with several thousand war trucks. Sales agents of this organization, it is said, have been active in Los Angeles, where 75 trucks have been offered for sale at prices which defy competition.

Los Angeles dealers assert that prices are inflated for a time until a real prospective buyer appears and attractive discounts are offered which prohibit competition by other dealers. It is further claimed that these former Army trucks, remodeled or refinished in British shops, return without imposition of duty as "used" machines while they are later offered as new trucks.

Tariff Change Ineffectual

California congressmen have inquired as to the possibility of revising tariff duties, but found that the law could not be changed in this respect without meeting defeat as class legislation. Treasury officials thought it would be possible to offset this disadvantage by revision of the internal revenue act when it is called up at the special session next month.

There seems to be a good chance that this proposed legislation will be favorably received by committees and ultimately by Congress because the incoming legislative and administrative branches of the Government are committed to a policy of protection. It is stated that American manufacturers will co-operate with dealers in this measure in order that domestic markets may be protected.

The trucks were sold to the War Department, and an agreement was reached after the armistice that these machines would be sold abroad rather than disrupt American markets by their return and subsequent sale. The War Department kept to its bargain and sold to British and French dealers. These dealers repaired the trucks and cars and propose to reship them to this country. The exchange situation, free entry and the low costs make it possible for them to deliver these American-made foreign-owned trucks to American agents at prices far below current quotations for domestic products.

Depressive Effects Feared

Under existing tariff laws, American dealers and manufacturers are quite helpless to prevent the dumping at cut-rate prices, often below the production costs. The depressive effect of the Anthony "rider" to the Army appropriation bill, which would compel the sale of 10,000 trucks coupled with this latest menace to resumption of domestic sales, is expected to bring about unity among dealers and manufacturers in support of proposed amendments to the internal revenue bill.

The amendment, if adopted, would undoubtedly provide for the imposition of taxes on these imported trucks equal to the aggregate tax levied on trucks manufactured and sold in this country. The present Congress will not consider tax legislation, but it will be on the calendar for the next session.

Dealers have been advised this week that French traders contemplate action along lines followed by British dealers.

January Car Shipments One-third of Year Ago

CHICAGO, Feb. 5—Directors of the National Automobile Chamber of Commerce were informed by the traffic committee at their meeting here that carload shipments from the factories during January were 35 per cent of January a year ago, which marks a new low level.

It was decided that the directors would take up with counsel and the N. A. D. A. the recent court decisions regarding confiscation of cars transporting liquor.

The directors expect the recent reduction of 2 cents in the price of gasoline to help sales of cars and trucks.

BICKETT RUBBER ORGANIZED

WATERTOWN, WIS., Feb. 7—The Bickett Rubber Corp. of Watertown, Wis., has been chartered to engage in the manufacture of rubber products of all kinds. The capital is $100,000 preferred and 2000 non-par valued common stock. L. W. Bickett, Max G. Kusel and E. L. Hoge are the incorporators.

House Passes Bill to Sell Army Trucks

Action by Senate Will Decide Big Dumping Move—1000 Cars Included in Order

WASHINGTON, Feb. 8—Ten thousand Army trucks and 1000 passenger cars will be placed on the market within a few weeks unless the United States Senate amends or modifies the Army bill, which passed the House to-day, carrying the Anthony proviso, directing and authorizing the Secretary of War to declare a surplus of equipment and dispose of it on such terms and conditions as he may deem most advantageous to the best interests of the Government. Dealers and manufacturers throughout the country will have but little time to convince the Senate of the depressive effect the passage of this measure would have on the industry, inasmuch as there are few legislative days remaining for the present session.

Congressman Anthony was successful in obtaining favorable action on his measure. He steadfastedly refused to heed the pleas of the highway officials that the equipment be transferred. It was his contention that the road builders had sufficient automotive equipment on hand and could not absorb the trucks and other machines which he wanted sold. A slight revision, proposed by Congressman Mann of Illinois, clarifying the language of the provision, was adopted. The committee had reported "not less than 10,000 of the motor trucks and not less than 1000 of the automobiles owned by the War Department." The Illinois Congressman objected because it could be construed to mean that Congress forbid the Secretary of War to sell less than 10,000 trucks and 1000 automobiles at the same time.

May Sell in Small Lots

Congressman Greene of Vermont stated that the committee's language should be changed for it would not allow the War Department to sell five or ten trucks at a time. This change was subsequently made in the Mann amendment. The question was asked during the debate whether it would be possible to dispose of these trucks. Congressman Dempsey asserted it would not be a difficult matter and it would be possible for the Secretary of War to buy the balance himself, but in the markets.

The bill, as now passed, will be sent to the Senate. If the Upper House objects to this method of disposing of trucks and cars at a time when the domestic market is glutted and other Army trucks are dumped here by foreign dealers, it will be sent to conference.

Willys Corporation in Bankers' Control

Creditors and Stockholders Form Committees to Consider Plan of Action

NEW YORK, Feb. 7—Financial affairs of the Willys Corporation have been placed temporarily in the hands of a bankers' committee and no bills are being paid except with the consent of this committee.

A merchandise creditors' committee is being formed with the sanction of the bankers' committee and efforts are being made to obtain the consent of creditors for an extension of time which will permit of some constructive action.

The merchandise creditors' committee is headed by F. C. B. Page of the E. W. Bliss Co. and the other members include Joseph B. Tarbell of the American Brake Shoe & Foundry Co. and Theodore Beran of the General Electric Co.

A first preferred stockholders protective committee has been organized and it is understood its attitude will not be entirely sympathetic toward the bankers. The preferred stock of the Willys Corporation provides that no mortgages can be placed on any of the company's property except with the consent of 75 per cent of the preferred stockholders. Joseph P. Cotton of the law firm of McAdoo, Cotton & Franklin, is counsel for the preferred stockholders' committee which is headed by Howard Bayne and includes U. N. Bethell, Stedman Butterick, Thomas B. Gannett, Robert E. Hunter, Leclanche Moen and Robert L. Montgomery.

Stock Depositories Named

The depository for the preferred stock is the Columbia Trust Co. of this city and subdepositories are the First National Bank of Boston, the Central Trust Company of Illinois and the Girard Trust Company of Philadelphia.

A similar committee is being formed for the second preferred stockholders. A letter sent to them states that the company needs a large sum to meet contract obligations and commitments in connection with the new factory at Elizabeth, N. J.

The second preferred committee is headed by Arthur O. Choate of Clark, Dodge & Co. The depository will be the Bankers Trust Co. and the counsel O'Brien, Boardman, Parker & Fox.

All the various interests involved are exceedingly reticent as to their plans but it can be stated that reorganization and refinancing of the Willys interests is in prospect although none of the details are available. The subject has been under consideration by the bankers interested for several months. The bank chiefly interested is the Chase National and E. R. Tinker, president of the Chase Securities Co., is a director of most of the Willys units. Walter P. Chrysler, executive vice-president of the Willys Corporation, is directing the negotiations of the company with the bankers. Associated with him in this work is J. R. Harbeck, who recently resigned as vice-president and director of the American Can Co. to devote all his time to his automobile interests. These two men are also directing the affairs of the Maxwell-Chalmers Co.

Definite announcement of the reorganization plan is expected within the next thirty days as many of the corporation's bank loans mature about the middle of March. These loans were renewed at their last maturity date. They are said to aggregate about $20,000,000.

Willys-Overland Not Involved

The Willys-Overland Co. is not involved in any way in the refinancing of the Willys Corporation although 27 per cent of its stock is owned by the corporation. The property of the Willys Corporation includes the Electric Auto-Lite Corp. with a plant at Toledo, the New Process Gear Corp. with a plant at Syracuse, the Duesenberg Motors Co. and the huge new plant virtually completed at Elizabeth, N. J., for the production of the "Chrysler Six," which is not yet upon the market.

The Willys Corporation was incorporated in Delaware in 1917 as the Electric Auto-Lite Corp., and the present name was adopted two years later. In 1919 it acquired the entire capital stock of the New Process Gear Corp. and the Duesenberg Motors Corp. as well as the old plant of the Allen Motor Co. at Fostoria, Ohio.

The corporation has a purchase and sale contract with the Willys-Overland Co. providing for the manufacture by the corporation on a large scale of a new lightweight six-cylinder automobile. This contract provides, among other things, that the Willys-Overland Co. shall market this car through its sales organization and a special unit.

The security holdings of the Willys Corp. include 27 per cent of the common stock of the Willys-Overland Co.; $1,000,000 of the 7 per cent convertible second preferred stock of the Fisk Rubber Co. in which John N. Willys is one of the largest stockholders, and $1,000,000 of the 7 per cent convertible second preferred stock of the Federal Rubber Co. which is controlled by the Fisk Rubber Co.

Capital Stock Outstanding

The capital stock of the Willys Corporation consists of 5,000,000 shares of common of no par value; $15,000,000 of 8 per cent cumulative convertible first preferred with a par value of $100 and $10,000,000 of 7 per cent cumulative convertible second preferred with a par value of $100. All the preferred stock is outstanding and 4,450,000 shares of the common. Of the unissued common stock, 300,000 shares are reserved for the conversion of first preferred at the rate of two shares of common for each share of first preferred and 250,000 shares are reserved for the conversion of second preferred at the rate of two and a half shares of common for each share of second preferred. The company has no funded debt.

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U. S. Rubber Shows Higher 1920 Income

Report Earnings at Rate of $19.82 a Share—Inventory Position Good

NEW YORK, Feb. 7—The preliminary report of the United States Rubber Co. for last year shows net profit, after all charges and allowances for Federal, British and Canadian taxes, of $21,275,524, or the equivalent after preferred dividends of $19.82 a share on the $81,000,000 common stock. In the previous year the net profit was $17,730,237, equivalent after preferred dividends to $17.59 a share on the $72,000,000 common stock then outstanding.

The chief items of the income account are shown in the following table:

	1920	1919
Sales	$255,744,685	$225,589,465
Net income	26,925,173	21,396,099
Interest	5,649,649	3,365,862
Net profits	21,275,524	17,730,237
Pref. dividends	5,200,000	5,041,476
Divs. subsidiary cos.	18,718	19,567
Com. dividends	6,480,000	2,098,576
Surplus	9,576,806	10,570,618

In a statement by Samuel P. Colt, chairman of the board, he says:

"The company at no time during the year had any so-called forward contracts for crude rubber, and, therefore, was in a position to take advantage of the low market prices which have prevailed for some months, with the result that at the close of the year your company had on hand and subject to delivery about seven months supply of crude rubber at an average cost of $0.2679 per pound. Therefore, it was not necessary to write off anything on account of crude rubber.

"As to all other materials and supplies, the company had a short inventory position during the latter part of the year and, therefore, was able to take advantage of the decline in prices.

"In accordance with past conservative practice in respect to making reserves, your Directors will in due time consider the advisability of appropriating some part (not exceeding $6,000,000) of the net surplus of 1920 to be set aside as a reserve to take care of any contingencies that might arise."

HALLEYS CLOSES FOR TIME

LONDON, Jan. 17 (*Special Correspondence*)—Cancellation of orders leaving 100 completed chassis on their hands has resulted in Halleys' Industrial Motors, Ltd., Scotland, refraining from making any distribution among shareholders for 1920, despite a fair profit shown by accounts for the year's trading. The directors at a meeting have just announced that no orders were being received to take up these trucks in stock; clearly the outlook is not encouraging. Halleys make one model only, a 3½-ton chassis, which is the only British truck with a six-cylinder engine. Their plant is practically closed down for the time being.

Pierce-Arrow Adds $1,000,000 to Surplus

Company's Position Regarded as Strongly Entrenched—Inventory Losses Written Off

BUFFALO, Feb. 3—Pierce-Arrow company's report for 1920, made public to-day, makes a distinctly gratifying showing for Buffalo's biggest motor car industry. The net earnings after all charges, taxes and depreciations allowances of $1,769,914, or more than twice the annual preferred dividend requirements of $800,000, is considered good in view of the sharp depression which came in the automobile trade in the last half of 1920.

It is true that the balance of $3.88 a share applicable to the common stock is only a little more than half the $6.75 a share earned in 1919—but in that year the automobile industry was at high tide. But the fact that there was a surplus for the year of practically $1,000,000 carried to the balance sheet and that the total accumulated surplus is shown as $4,541,546 is satisfactory testimony as to the way Pierce-Arrow has weathered the trade cyclone.

Inventories are shown as of Dec. 31, 1920, at $16,470,662, an increase over those of the year previous amounting to $2,925,241. The valuation used in making the inventory have been pared to cost and replacement figures. Patents, trademarks, etc., are given only a nominal value and are lumped at "$2."

Quick net assets, aside from inventories, are shown as a total of $3,383,872, of which $1,338,099 is cash. Reserves set up for depreciation of plant, etc., are given as $2,032,784.

President G. W. Mixer, in submitting the report, states that the reorganization of the plant from the basis of its wartime activities has been fully completed and, in making these changes, much has been done to modernize equipment and reduce manufacturing costs.

Processes have been revised for both quality and economy. Mixer adds that some 80 per cent of the tools and machines used in making older models of cars and trucks no longer in active manufacture have been charged off against the previous reserve for depreciation. The plant is now in the best of modernized productive capacity for present and next season's output of models.

Although nothing is said in the report or its presentation as regards present business or indications, it is known the company is getting an increase of orders.

OLDSMOBILE SHIPS TRAINLOAD

LANSING, MICH., Feb. 4—A solid train consisting of 20 cars carrying 60 Oldsmobiles left Lansing this week for Chicago consigned to one of three Olds dealers in that city. The consignee, the North Side Oldsmobile Co., 5206 Broadway, will distribute the entire allotment.

RAILROAD CONCEDES PASSENGERS TO BUSES

RICHMOND, VA., Feb. 5—Representing that motor travel on highly improved highways paralleling its line has seriously affected its passenger traffic, causing this service to be operated at a loss, the Chesapeake & Western Railway Co. has petitioned the Virginia State Corp. Commission for permission to abandon passenger service on the road, it was announced to-day. The railroad is 50 miles in length, extending from Elkton to Stokesville in the valley section, and connecting with the Baltimore & Ohio and the Southern railways. It plans to continue its freight service.

Transit Company Adds New Truck Equipment

DETROIT, Feb. 4—Acason Motor Truck Co. has received an order for 100 trucks from the Red Ball Transit Co. of Indianapolis. The Transit company, according to General Manager W. B. Hiner, plans to greatly enlarge the scope of the work of the company during the year, and inter-city motor vehicle transportation operations are planned between all the larger cities in the country.

The Red Ball Transit Co., which specializes in inter-city overland hauling, was organized three years ago and has been highly successful. The company uses heavy duty trucks with large enclosed bodies resembling moving vans. The main lines now operate to cities between Indianapolis and New York by way of Cleveland on one route and by way of Pittsburgh on the other. There also is a line between Indianapolis and Chicago and another between Indianapolis, St. Louis and Kansas City. The headquarters of the company are at Indianapolis, with a branch office in Chicago.

The company does no local hauling, devoting its attention entirely to inter-city business. It is planned to extend the activities to the Pacific Coast, and sufficient business is on the books, according to Hiner, to justify the placing of 35 additional trucks in operation immediately.

SIMPLICITY FILES PETITION

GRAND RAPIDS, MICH., Feb. 4—A petition in bankruptcy was filed in the Federal District Court this week for the Simplicity Wheel Co. by Attorney Charles V. Hilding. Total liabilities are given as $175,000, and the estate of F. W. French, defaulting cashier of the Grand Rapids Savings Bank and head of the wheel company, is charged with $150,000 of the unsecured claims. Attorney Hilding is petitioner for the wheel company and also receiver for the French estate. Secured claims are $5,242 and the total assets are $36,340, consisting largely of stock in trade.

Miller to Reduce Salaried Employees

Third of Large Companies to Make 10 to 25 Per Cent Reduction

AKRON, Feb. 7—The Miller Rubber Co. is the third tire corporation in Akron to reduce salaries, in addition to flat wage cuts. Notices distributed by the company to all salaried employees, notify them of salary reductions understood to range from 10 to 25 per cent, to become effective Feb. 15. Miller, like practically all other Akron companies, previously had cut wages, hourly rates and piece work rates.

Miller officials in announcing the salary readjustments call attention to the necessity for the step in view of the readjustment of economic conditions, and also advise that salary reductions will be based upon efficiency of service of their employees, rather than enforcing a flat rate of reduction.

"We implore our employees," the notice says, "to recognize the conditions, as the readjustment of the world's business and commerce cannot possibly be made on a lop-sided basis, and while the reduction in commodities has not yet fully reflected to the consuming buyer, as liquidation proceeds buying prices will automatically seek their level. We ask that our employees make every effort possible to adjust themselves to the conditions as they exist, and those who have practiced the extravagances displayed should bring themselves to a realization that thrift and economy, both in personal affairs and in employment duties, will become absolutely necessary. We are adjusting the rates of salaries to equal the service rendered as nearly as possible."

Firestone Increases Hours

Wage readjustments made effective Feb. 8 by the Firestone Tire & Rubber Co,, coincident with an increase in factory working hours, are expected to permit increased production without any material increase in cost, it is announced. Firestone departments have been working five hours a day. Under the new schedule employees in the factory will work seven hours a day for the same daily rate as under the five hour schedule, thus giving the company practically ten hours increased factory operation each week, without any payroll increase.

CHAIN OFFICERS ELECTED

MILWAUKEE, Feb. 7—The Auto Life Tire Chain Co., which established a factory at Cedarburg, Wis., several months ago, is increasing production to meet orders from jobbers and dealers. At the annual meeting the following officers were elected: President, E. A. Hoya; vice-president, A. L. Wolff; secretary, William F. Schad; treasurer, F. A. Andree.

Chicago Show Starts Midwest Business

Car Prices Evoke Little Comment —Distributers Prepare for Spring Buying

(*Continued from page* 286)

In a number of instances the matter of price was spoken of by the prospect but this did not figure very materially in the discussions at the booths. General business conditions affected in a large measure the sale of cars that would be bought by wage earners. The buyers of the higher-priced cars have pretty well established positions, and while the purchasers of the moderate priced cars are to a certain extent concerned in readjustments they are not affected as deeply as are the lower-priced car buyers.

That the dealers feel that the show will bring a strong revival of buying, with thorough merchandising efforts inaugurated around the prospects obtained at the seven-day exhibit, is evidenced by the fact that two of the principal distributers of the moderate priced cars have, during the week, received carload shipments of cars. They are forestalling any shortage in supply that the spring may bring.

Detroit Gains Faith in Normal Resumption

DETROIT, Feb. 7—The returning contingent of Chicago show visitors struck Detroit like a breath of fresh air. Detroit has been undeniably pessimistic for some weeks. A great many of those who went to the New York show came back with this pessimism relieved to some extent, but they were not convinced. Practically all those who went to Chicago have come back convinced that business has started on the upward trend.

The beginning of buying by the public will not be felt immediately at the factories, as there is considerable slack that must still be taken up. If the figure of 120,000 surplus cars in the country is correct, this means nearly two months' purchasing at the current rate. Unless buying is accelerated to some extent, the factories will not feel the actual buying until the middle of March. There is sufficient indication of dealer interest, however, to have convinced the average factory that it is perfectly feasible to start on a reasonable production schedule and thus build up an organization that will pick up the load when it begins to be felt.

There have been some great lessons learned during the past year. Manufacturers meeting at Chicago as well as New York discussed these freely. Perhaps the greatest thing that has been learned is the necessity for flexibility in the manufacturing schedule. No one could tell a year ago that business would drop so rapidly as it did toward the end of last year, and bankers' prophecies on this point were ignored. The result is that contracts for parts were made over long periods and for great quantities, working an injustice on the parts maker as well as resulting in piling up inventory at a time when it was very necessary to keep it down.

The parts makers have in many cases asked the car manufacturer to help bear the load. For instance, the Zenith Carbureter Co. has asked manufacturers using their product, where these concerns are well stocked with carbureters, to pass the business along and not let the parts manufacturer hold the bag. They have asked that for every 100 cars made the manufacturer take fifty carbureters. This request has been acceded to in a great many instances and is regarded as a very equitable arrangement.

Highest Production in May

To sum up the situation from the manufacturing standpoint, general production at present is running, leaving out Ford, at about 25 per cent capacity. This may be expected to increase, if one were to hazard a prediction based on general observation, to 35 per cent in February, 50 per cent in April and 60 per cent in May. At this figure it is very apt to remain for practically the balance of the year.

The Ford situation is expected to have a material benefit on the industry, in that a price increase which is confidently expected will be a material factor in showing the public that some of the cars at least are at rock bottom prices. It is a fact that is generally clear to the educated public that some cars are better buys from a money standpoint than others. This is a situation which will have to clear itself, and frankly speaking there are cars that will have to come down in price in order to meet competitors' prices.

From the parts maker's standpoint it is probable that until confidence is restored he will have to work on three-month orders rather than six-month until such a time that full confidence is restored, but unless every sign it is possible to see fails, he will find his shop again producing and his business growing on its merits.

Milwaukee Sales Most in $1500-$2000 Class

MILWAUKEE, Feb. 7—How well the annual Milwaukee show of 1921 functioned as the beginning of the new selling movement, is indicated by semi-official figures gathered from passenger car dealers who exhibited.

An analysis reveals the information that show sales were mainly in the medium and high-priced passenger car classes. More than one-half of the total retail sales were in the class from $1,500 to $2,000, and one-third from $2,000 to $3,000, the remainder being almost equally divided between the $500 to $1,000 and the $3,000 to $7,500 classes. Last year the majority of sales were in the $500 to $1,000 class.

Cleveland Confident of Increased Buying

Factory Representatives at Shows See Indications of Good Normal Business Year

CLEVELAND, Feb. 7—Factory representatives at the New York, Chicago, Cleveland and other shows have come home convinced that there will be a rebound from the low selling and low production conditions that have prevailed, and that the first movement upward is under way.

"The tide has turned and from now on we may be assured that the automobile business will gradually come into normal," said Frank C. Chandler, president of the Chandler Motor Co., upon his return from the Chicago show. "Orders are coming into the factory in better volume than they did in January. January was better than December, and March will be better than February. Later in the year conditions will be even better and I am optimistic about the record that finally will be written around the present year."

At the Templar factory, Daniel L. Britton, factory manager, said the force of workmen would be increased 50 per cent within the next three weeks to take care of increased schedules. Dealers' orders are coming in in such number that larger production is essential.

Peerless and Winton both report that increased output is contemplated. Other manufacturing establishments are putting their equipment in shape in order to take care of orders expected when the trade gets into full swing.

One of the hopeful signs has been seen in the agricultural districts of the State. The farmer has been mighty sore at the drop in prices for farm products, and especially so when he compared these new prices for what he produces with prices demanded for the things he must purchase. Salesmen have been received better lately in the Ohio agricultural districts, according to reports received by dealers.

The reduction in the price for gasoline is another factor that has helped to create an optimistic mood in the industry.

White Merges Working Forces

At the White Motor Co., which has been operating a full day and night force during the period when other plants were either shutting down or greatly curtailing production, a reduction in operations will take place March 1. In the last few months working time has been reduced to five days a week and lately to four days.

Commencing March 1, the night force of 1700 men will be combined with the day force. One force will work three days a week and the other three days. In this way more men will be employed than if the company had adopted the policy of working a single force six days a week.

N.A.C.C. Would Slash Billion From Budget

Taxation Committee Prepares Recommendations on Governmental Appropriations

NEW YORK, Feb. 8—Elimination of the one billion dollar increase proposed in certain Federal departmental estimates for 1922, reduction of a military and naval program to its lowest practicable point, and a further slash of 1 per cent in the estimate, as a first step in a return to "sane, normal conditions," are the major proposals contained in a tax program approved to-day by the directors of the National Automobile Chamber of Commerce. All told, the reductions asked amount to approximately $1,500,000,000.

Other proposals, summarized, include:

Funding of the cost of the war, spreading the operation over a period of 50 years, including therein the floating indebtedness, Victory notes, and war saving certificates which come due in 1923.

Suspension of the program of retirement of the war debt during the period of materially increased expenses growing out of the war or at least until 1923.

Funding of demand obligations of Allies and acceptance of funding securities for unpaid interest which they may be unable to meet.

Repeal of the excess profits, excise, transportation, consumption and other tax burdens growing out of the war.

Provision for additional revenue from a moderate protective tariff.

If still further revenue is required, consumption tax is suggested of 1 per cent on all commodities based on the retail sales to the consumer.

In explanation of the principles proposed and to bear out an expressed conviction that if the major premise of economy is accepted, no further taxes will be necessary, a table of proposed expenditures and estimated receipts for the fiscal year 1922 has been prepared by the taxation committee of the chamber, made up of C. C. Hanch, chairman; H. H. Rice, J. Walter Drake, Charles Clifton and F. I. Barrows. The table is shown on this page.

M. & A. M. A. Committees Named by Directors

NEW YORK, Feb. 7—Committees for the coming year have been appointed by the board of directors of the Motor & Accessory Manufacturers Association. The executive and finance committees, which are identical, are composed of the following: E. H. Broadwell, chairman, Fisk Rubber Co.; C. E. Thompson, Steel Products Co., Cleveland; E. P. Hammond, Gemmer Mfg. Co., Detroit; W. O. Rutherford, B. F. Goodrich Co.; G. Brewer Griffin, Westinghouse Electric & Mfg. Co., Pittsburgh; A. W. Copland, Detroit Gear & Machine Co., Detroit; J. M. McComb, Crucible Steel Co. of America, Pittsburgh.

The show and allotment committee is composed of Rutherford, Griffin and C. H. L. Flintermann of the Detroit Pressed Steel Co.

The banquet committee is headed by McComb and the membership committee by Copland.

FEDERAL EXPENDITURES AND RECEIPTS FOR 1922 PROPOSED BY TAXATION COMMITTEE OF N. A. C. C.

EXPENDITURES

Total estimated ordinary expenditures 1921		$4,673,395,278
Less item Federal control railroads		1,025,000,000
Total estimated expenditures 1922 if maintained at level of 1921		$3,648,395,278
Urgent Deficiency Item		478,000,000
		$4,126,395,278
Less reduction of 10 per cent as first return to normal standard		412,639,528
		$3,713,755,750
Postal Service payable from Postal Revenue		585,406,902
Ordinary expenses payable from other Sources of Revenue		$3,128,348,848

RECEIPTS

Internal Revenue:		
Income and Profits Taxes	$2,625,000,000	
Miscellaneous	1,375,000,000	
	$4,000,000,000	
Less loss due to repeal of excess profits	450,000,000	
Less all consumption taxes save tobacco and liquor based on 1921 receipts	$714,386,743	
	$2,835,613,257	
Loss due to reduction in surtax	230,000,000	
	$2,605,613,257	
Plus increase in corporate income due to excess repeal	45,000,000	
	$2,650,613,257	$2,650,613,257
Public lands		2,000,000
Miscellaneous sources		493,000,000
Panama Canal tolls, etc.		14,530,000
Total estimated receipts exc. public debt		$3,510,143,257

Reeves Finds Trade in Rallying Stages

Coast Markets Better Than Central Districts—Kansas Credits Again Available

NEW YORK, Feb. 8—Alfred Reeves, general manager of the National Automobile Chamber of Commerce, has just returned from a three weeks' trip in the West, where he addressed meetings of dealers, manufacturers and bankers in Wisconsin, Illinois, Missouri, Iowa and Nebraska. He reports encouraging signs of returning business, although after the spring trade future progress in the automobile industry will depend largely on the progress that other industries make in returning to normal.

Information gathered on this trip, coupled with reports from other sections of the country, indicate that the best trade in cars and trucks at present is along the Atlantic and Pacific Coasts. It is somewhat spotty in other parts of the country.

New York, Pennsylvania, California, Ohio, Illinois and Wisconsin seem to show the best sales, while the poorest sections appear to be through the South, particularly Texas, in the Dakotas, and in Iowa and Nebraska, although with a general upward turn everywhere.

"As in 1914, 1917 and 1919, the automobile shows have marked the return of buying in this country and a change of spirit not alone in our own industry but among business men generally," said Reeves.

"Surveys in the different sections of the country supplied the interesting information that buyers are waiting for lower prices or more stable prices. They want to be sure that prices will not be changed within the next few months. Almost all say they intend to buy another car, and when asked the kind, invariably mention a car of higher price than the one they are using.

"Trade on the Atlantic Coast and on the Pacific Coast seems to be in the best shape. Wisconsin is doing well because her dairy products bring cash every day. Constantly improving trade is reported from Ohio and Illinois. Poor trade is reported from the South, especially Texas, and from sections of Nebraska, Iowa and the Dakotas.

"We find dealers with their houses in order and in the right spirit for a spring sales campaign. They have some grievances against the manufacturers, just as the manufacturers occasionally have grievances against the dealers. That there is a fine spirit of co-operation, however, is evidenced by the acceptance by the directors of the N. A. C. C. of the suggestion by the National Automobile Dealers Association for a conference of committees to review trade conditions to see what can be done in a co-operative way that will be mutually helpful.

"Our meetings with the bankers showed

(*Continued on page* 293)

Improvement Slight in French Industry

Factories Extend Activities — Citroen Cuts British Price— Urge Tax Revisions

(*Special Cable to* AUTOMOTIVE INDUSTRIES)

PARIS, Feb. 5—Only very slight improvement was shown in the French automobile industry during January. No factories were working more than 50 per cent of capacity and in some cases production was as low as 10 per cent. To give employment to the greatest number of men, factories are running only four days a week.

Many firms are meeting present difficulties by getting into other branches of the engineering trade. Renault is making tools and factory equipment. Berliet is building narrow track railroad material.

There have been no price reductions in the French market, but Citroen has cut prices £100 on the British market. The Lorraine-Dietrich factory is practically closed because of the fusion with Clement-Bayard, which makes one factory sufficient to meet the manufacturing requirements of the two companies.

The Austin tractor factory in France has ceased production. Renault has a stock of 1400 passenger cars. The weeding-out period has resulted in the disappearance of several of the smaller concerns. These are Turcat-Mery, Majola, Sizaire-Naudin and Butterosi. Many others are in considerable financial difficulties, but the courts are showing great leniency in not forcing firms into bankruptcy as long as any reasonable arrangement for continued operations can be made.

Some leaders in the industry believe the period of depression in France will last two years. The truck market is glutted with army stocks, there being still 23,000 trucks lying in Government parks and all dealers loaded up.

High car taxation and the high price of gasoline are largely responsible for the passenger car depression. The syndicate of automobile manufacturers has again petitioned the government to relieve the situation by abolishing the gasoline tax, which is now higher than the retail pre-war gasoline selling price, and also to repeal the 10 per cent luxury tax on automobiles.

As proof of the utility of automobiles the manufacturers point out that of 93,115 passenger cars paying taxation last year, 59,492 were officially recognized as utility vehicles and eligible for half-taxation rates.

The French Government aviation credits for the year 1921 total 527,354,645 francs, of which 33,215,000 are subventions for the regular passenger carrying lines, and 11,850,610 for the general budget civil aviation.

One Talbot-Darracq and two Sunbeams have entered for the Indianapolis race, the drivers being Boillot, Thomas and Resta.

Tax Repeal Helpful in Canadian Market

OTTAWA, ONT., Feb. 8—Present activities in the Ottawa district indicate that the automobile business will see good normal sales this year. Price reductions are already announced by certain manufacturers, new models are being placed on the market by Canadian firms and already shipments of several of the new cars have been received by Ottawa dealers. The industry has made rapid recovery from the adverse situation which prevailed as a result of the removal of the luxury tax and as a result of reconstructive developments last fall.

The dealers sustained a personal setback when the luxury tax was removed, but the loss of tax on unsold automobiles in stock at the time that the Government levy was abolished is being absorbed by the manufacturers and the retailers, and this incident is considered closed. An outstanding feature of the Montreal Automobile Motor Show just concluded was the genuine feeling of optimism that prevailed in the automobile trade and otherwise. Every exhibitor and dealer gave evidence of a cheerful tone throughout the trade and the outlook was considered extremely bright by everyone.

Higher Patent Salaries Favored by Committee

WASHINGTON, Feb. 7—The Nolan Bill, which fixes the compensation of employees of the Patent Office, has been reported out of the conference committee and recommended for favorable action. The conference committee accepted the salary recommendations of the House committee, which are about 20 per cent higher than those recommended by the Senate. In this bill the Commissioner of Patents receives $6,000. The time remaining for passage of this bill is quite short and those interested in its success would be wise to consult their Congressmen.

LANDIS MACHINE CUTS PRICES

WAYNESBORO, PA., Feb. 7—Beginning March 1, the Landis Tool Co. will make a general reduction in prices on all machines with the exception of the crankshaft grinding machine. This reduction will average 15 to 20 per cent on the entire line with the exception of the one machine.

Dunlop Management Arouses Disquiet

Dividends for Last Quarter Passed —Two Directors Resign— Arrange New Credits

LONDON, Feb. 5—(*By Cable to* AUTOMOTIVE INDUSTRIES)—The annual report of the Dunlop Rubber Co., Ltd., shows a balance of 1,700,334 pounds sterling, but the directors decided to pass the ordinary dividend and the preferred dividend for the last quarter.

Because of dissatisfaction over the management of affairs, Chairman Ormrod of the board of directors and Director Dawson have resigned. F. A. Szarvasy, chairman of the British Foreign & Colonial Corp., has become temporary chairman of the board and will be in control of finances.

Banks have come to the relief of the company, but it is proposed to raise a larger amount later by the sale of debentures. Szarvasy will make a full statement of the company's affairs to stockholders on Feb. 11. It is understood that Lord Ashfield of the London Underground Electric Railway later will become chairman of the board.

Necessary credits have been arranged to meet all obligations pending permanent financing. Because of the financial situation it has been found impossible to further finance the Dunlop American Co. and the English company has assumed the responsibility for it, thereby safeguarding its position through the assets of the American concern.

Domestic Mail Rates Extended to 5 Countries

NEW YORK, Feb. 4—The domestic postal rate, beginning this month, will apply on all letters and post cards to Bolivia, Colombia, Honduras, Nicaragua and Peru, according to an order just issued by the Postal Department. The new rates have been put into effect as the result of negotiations commenced at the International Postal Congress held last November at Madrid, Spain. The domestic rate also applies to periodicals (one cent for each four ounces or fraction thereof). The maximum weight for periodicals and other printed matter, including commercial papers, is 8 lb. 12 oz., while the maximum volume for single volumes of printed books will be 11 lb., the maximum dimensions for this class of mail matter in the form of a roll being 40 in. in length and 6 in. in diameter. Cuba also has confirmed the new postal convention.

PERFECTION ASSETS HIGH

MILWAUKEE, Feb. 7—Schedules filed by the Perfection Engine Co. upon an involuntary petition in bankruptcy, show assets of $27,273 and liabilities of $16,306. The first meeting of creditors is called for Feb. 11.

Willys Corporation in Bankers' Control

Formation of Single Operating Company May Follow—Interests of Company Extensive

(*Continued from page* 288)

The first preferred stock provides that without the consent of at least 75 per cent of the outstanding first preferred the corporation may not:

1—Create or permit any subsidiary company to create any mortgage other than purchase money mortgage, lien or incumbrance on the property.

2—Issue any obligations maturing later than one year from the date thereof.

3—Issue any stock having priority over or on a basis with the present first preferred.

4—Authorize additional first preferred stock without the consent of 75 per cent of the holders of outstanding first preferred unless the net value of the tangible assets of the corporation including the proceeds of the preferred stock to be issued, are three times the largest aggregate amount of first preferred stock outstanding, or the net earnings for twelve consecutive months out of the preceding fourteen months are three times the dividend requirements of the first preferred outstanding and to be issued.

The first preferred has preference as to dividends over both the second preferred and common stock and in case of voluntary liquidation or upon dissolution of any capital assets, holders of the first preferred are entitled to 110 and accrued dividends. The stock also provides for a sinking fund to begin this year.

The first preferred stock has no voting power unless four quarterly dividends are in default of sinking fund payments, in either of which events it shall have the right to elect the majority of the board of directors.

While no authoritative announcement has been made covering the proposed reorganization of the Willys interests, it can be said that the program which had been virtually determined upon a few weeks ago was for the consolidation of all the Willys units in a single company patterned after the General Motors Corp. This would include the Willys-Overland Co. and the Willys Corp. with their various subsidiaries.

Overland Covers Wide Field

The Willys-Overland Co. owns the Willys Morrow Co., of Elmira; the Wilson Foundry & Machine Co., of Pontiac; the Moline Plow Co., and all branches of the plow company. The Willys-Overland Co. has plants at Toledo, Elyria, Ohio, and Elmira, N. Y.

John N. Willys personally is credited with owning control of the Republic Truck Co., of Alma, Mich.; which in turn owns all the common stock of the Torbensen Axle Co. of Cleveland. Willys and two other men control the Fisk Rubber Co., which in turn controls the Federal Rubber Co. Another company controlled by Willys and his associates is the United States Light & Heat Corp. of Niagara Falls.

If such a consolidation were effected, it would result in the formation of a gigantic corporation ranking next to General Motors in the automotive field. Promoters of the plan would be confronted with countless difficulties and an immense amount of detail which could be smoothed out only by long continued conferences. One of the chief difficulties would rest in the fact that the preferred stock in nearly all the Willys companies contains provisions similar to that carried in the first preferred in the Willys Corp.

The difficulties of the Willys Corp. are the result of conditions brought about by the period of readjustment through which the country is passing and which caused the virtual collapse of the market for its products.

Bank Attitude Constructive

The bankers interested in the corporation have assumed a constructive attitude and it is confidently believed the merchandise creditors will do nothing to embarrass the backers of the reorganization plan. They are expected to assume the constructive attitude recently displayed by the creditors of the Moline Plow Co.

The troubles of the corporation are believed to be of a purely temporary character and when the demand for their products increases, as it undoubtedly will in a short time, it is expected the burden will soon be lightened. It is considered certain that none of the interests involved will take any step which would necessitate drastic action and that some means will be found which will adequately protect all the investments already made.

Walter Creditors to Get Commission on Sales

NEW YORK, Feb. 4—Business of the Walter Sales Co., Inc., in this city will be continued under a creditors' committee, on which will serve John G. Scattergood, vice-president of the Gotham National Bank; C. W. Decker, manager of the industrial finance department of Robertson-Cole Co.; Seymour K. Fuller, attorney for the Mutual Finance Corp., and William Walter, president of the Walter Motor Truck Co. Unsecured debts of the company total $125,000 and assets possibly less than $2,000.

The committee hopes to realize enough revenue to pay the claims of creditors in one or two years by continuing the sale of Walter trucks. An agreement has been made with a well-known truck company whereby William J. Aitken will sell its trucks on commission, and will also sell the Walter truck, the commission on the latter, less expense of sales, to be distributed pro-rata to the creditors.

Reeves Sees Trade in Rallying Stages

Question of Credits Important to Farmers—Hysteria in Industry Passed Over

(*Continued from page* 291)

that the big city banks are doing their share in carrying the distributers and big dealers. Because of the heavy burden of the small town banks in carrying crops of farmers, they have not been able to do much to help the small town dealer.

"We had a long session with Governor Miller of the Federal Reserve Bank of Kansas City, and Asa E. Ramsay, his deputy governor. They insisted that reduction of automobile credit last year was vitally necessary in their territory, not because the automobile business was not essential, but because it already had big credits, and other matters were more pressing. Mr. Miller said his bank had just gotten out of debt for the first time in eighteen months and he hoped soon to be able to again rediscount automobile and some twenty other kinds of paper that had been temporarily sidetracked during the pressing need from the agricultural districts. The member bankers have continued to care for their automobile customers.

"The farm trade is certain to be poorer than usual this year. Not alone are crops, raised with high labor costs, bringing very much lower prices than expected, but many tenants have raised their crops on land rented at high prices in some cases where the crop will not bring an amount equal to the rent.

"On this three weeks' trip we found that the hysteria in the industry has passed and that the manufacturers and dealers are putting their houses in order and are preparing for a conservative, normal year with intensive sales effort as the high keynote.

Truck Dealers Discouraged

"In connection with trucks, we found the dealers somewhat discouraged with present conditions. A slowing down in business has materially decreased the demand, while the open weather has permitted the railroads to carry all the freight offered. In fact, the railroads now report 300,000 idle freight cars.

"Bankers and the far-seeing dealers know that the truck business has a fine future, which depends somewhat on how soon we have renewed business activity and how soon the program for our much-needed building operations get under way. The railroads, too, will buy trucks for short haul work, which spells brighter days for motor trucks, of which we have less than a million in use."

Reeves will attend a dealers' meeting at Syracuse Friday night, and will visit other cities as his time permits.

Goodyear to Operate Under Voting Trust

Details of Refinancing Wait Stockholders' Approval — Name Supervising Committee

NEW YORK, Feb. 9—The eagerly awaited report of the plan decided upon for the reorganization and refinancing of the Goodyear Tire & Rubber Co. was made public to-day. It provides for recapitalization and readjustment of the debt and was agreed upon only after weeks of negotiation.

The program will be submitted to the stockholders for ratification at a special meeting to be held in the next fortnight. The adjourned meeting which was to have been held Friday for discussion of the refinancing will be deferred again.

There have been persistent reports that when the plan went into effect there would be important changes in the management with the elimination of President Seiberling from active control but official confirmation is lacking. Robert T. Swaine, who is associated with Paul D. Cravath, counsel for the company, said to-day there was no certainty any changes would be made and denied emphatically that any had been decided.

The agreement provides that provision satisfactory to the merchandise creditors will be made for the future election of directors by the creation of a voting trust or by the creation of management stock vested in five persons designated by the merchandise creditors whose claims are said to aggregate $70,000,000.

Before the plan can be declared operative it must be approved by the company's stockholders in a meeting to be held shortly, and the stocks which are to go to the merchandise and contingent creditors must be exchanged for the debt by negotiation with every creditor. Steps taken denote co-operative progress, but it is recognized that it will be several weeks before the plan can be consummated. The only issuance of securities for sale to the investor contemplated is $25,000,000 of first mortgage twenty year 8 per cent sinking fund bonds, but that financing will not be undertaken until the junior situation is cleared up.

Plan Generally Approved

The plan, as agreed to, is a sort of when, as and if issued affair, although it has been assented to by the bankers, the largest creditors and the holders of a majority of the company's common stock. Holders of the existing common and preferred stock will receive like amounts of stock in the reorganized company, except that the shares will be changed to no par value for the purpose of wiping out the existing deficit and of funding 25 per cent of the company's liabilities on merchandise commitments, on which specifications and prices have been fixed. Then the company will be recapitalized by the issuance of the following additional securities: Twenty-five million dollars of first mortgage bonds, $25,000,000 of ten year 8 per cent sinking fund debentures, $35,000,000 of 8 per cent preference stock, $65,000,000 of 7 per cent preferred stock, and 900,000 shares of common stock of no par value.

The bank creditors' committee will try to effect the sale of $25,000,000 of debentures, $35,000,000 of prior preference stock and 256,000 shares of common stock to present holders of the company's stock. Cash realized by the company from that sale will be applied toward the payment of its bank debt and to provide it with new working capital.

Will Pro-rate Contracts

Regarding the pro-rating of material contracts the plan says:

"Such arrangements as the merchandise creditors' committee may approve shall be made to the end that the company shall not be required to take materials on contracts on which specifications and prices have been fixed faster than they are needed for production, provided it takes no similar materials from others than those with whom it has contracts at present, and also to the end that deliveries when taken shall be equitably prorated, the particular kind of material considered, to such existing contracts, and in the case of rubber to existing contracts and rubber now pledged to secure bank debt. The banks holding debt so secured will be asked, as part of the plan, to extend the debt pending such use of the pledged rubber."

Present commitments for future deliveries of merchandise on which specifications and prices have been fixed are:—

For rubber	$ 7,200,740
For cotton	5,664,000
For fabric	41,879,763
For other materials	215,000
Total	$54,959,503

The plan will be carried out under the supervision of a bank creditors' committee, composed of Robert C. Schaffner, Chicago; John Sherwin, Cleveland, and Ralph Van Vechten, Chicago; a merchandise creditors' committee, composed of W. E. Bruyn, New York; F. L. Jenckes, Providence; Myron C. Taylor, New York; a preferred stockholders' committee, composed of George W. Crouse, Akron; Reamy E. Field, Cincinnati; Charles A. Morris, Cleveland; A. H. Scoville, Cleveland, and J. Herndon Smith, St. Louis, and a common stockholders' committee, composed of Fred S. Borton, Cleveland; C. R. Erwin, Chicago; E. E. Mack, Canton; Russel L. Robinson, Akron, and F. A. Seiberling, Akron.

VAN SICKLEN ON PART TIME

ELGIN, ILL., Feb. 7—A report that the Stewart-Warner Corp. is negotiating for the purchase of the Van Sicklen Speedometer Corp. is denied by the latter, but it is announced that the plant, closed for some time at Elgin, Ill., has been reopened and will operate upon a five-day basis. It is also announced that the holdings formerly held by Eastern parties have been purchased by residents of Elgin. This, however, will not make any change in the policy or management.

New York Would Ban Use of Heavy Trucks

Prohibitive Taxes Outlined for Legislation on Capacities of 5-Ton and Over

ALBANY, N. Y., Feb. 8—Heavy motor trucks will be taxed off the roads under the plan of legislation being drafted here to meet the recommendations of Governor Miller's annual message. No secret is made of the intention of the legislation, the lawmakers taking the view that the use of heavy trucks imposes prohibitive upkeep costs, and that the best way to check this is to tax the heavy vehicles out of existence.

Under the proposed legislation annual fees of $500 are fixed for trucks of 5-ton carrying capacity; $600 for 6-ton; $700 for 7-ton, and $800 for 8-ton. Trucks of less than 5-ton capacity would be permitted to operate for $50 to $90 a year.

License fees for passenger cars under the new proposed rate would not exceed 10 cents per horsepower, whereas the present rate is 25 cents. The bulk of the tax would apply on car value and it is estimated would add about $2,000,000 annually to the State's revenue.

"The high tax on motor trucks is being proposed with the deliberate purpose of putting an end to the use of super-motor trucks on our roads," said Senator Lowman, chairman of the Senate committee on internal affairs. "We cannot drive them off the roads but we propose to tax them off. They tear up the roads frightfully and make not only the upkeep of the roads but the cost of construction and maintenance of bridges along the State roads prohibitive. The interests involved must be compelled by the only means at our disposal to distribute the weight of their loads and use smaller trucks."

The new motor vehicle bill will be sponsored by Senator Hewitt.

N. A. C. C. Prepared to Act

NEW YORK, Feb. 9—New York subcommittees of the National Automobile Chamber of Commerce will be prepared to take instant action when the new motor vehicle legislation is presented, said Harry Meixell, secretary of the motor conference committee. Whether the act will be as drastic as outlined is questioned by him, but he said every precaution would be taken to protect the interests of the industry.

REYNOLDS ORDERED DISSOLVED

MT. CLEMENS, MICH., Feb. 10—The Circuit Court of Macomb County has signed an order dissolving the Reynolds Motor Truck Co. and appointing Charles J. Reimold permanent receiver under a bond of $75,000. A request by a creditors' committee for the appointment of a joint receiver as their representative was denied. The creditors committee now is considering the advisability of filing an involuntary petition in bankruptcy.

Manufacturers Hold Production Rate Low

Surplus Stocks Diminish Gradually as Buying Resumes—Labor Resents Wage Cuts

DETROIT, Feb. 8—The attitude of automobile manufacturers indicating determination not to be swept off their feet by optimism engendered by the show is indicated in an almost universal decision not to increase production schedules for the time being. The tendency toward conservatism is shown plainly in figures for January with a total output of 14,615 cars in 32 factories in Detroit and Michigan and in the Overland and Willys-Knight plants in Ohio. This is far behind that of December, though a comparison would not be fair for the reason that Ford operated until Christmas Eve. The output in the same factories in January, 1920, was 180,310, which included the output of both Ford and Dodge.

While there are indications that production for February will not be increased materially, the spring demand will prompt increased schedules in March. Whether this spring business will reach anything like normal proportions is a problem, but it certainly will mean the resumption of operations in all plants with current demand determining output. It is contended by many that with the curtailed production of the last few months, the surplus stocks are rapidly being dissipated and the factories will be kept busy supplying the demand after March.

The contention is admitted generally; though the more conservative among the manufacturers regard the term "busy" as meaning that the factories will be operating full time but with greatly reduced forces and the production schedules ranging from 40 to 50 per cent of the 1920 record. Adding to prevailing unfavorable conditions are the labor troubles, which are beginning to loom large despite unemployment. While the strike now in progress is confined to the body plants, the agitation for return to high wages paid last year and antagonism toward present reduced wage scales is felt in the automobile plants. This attitude is being nurtured by idle men.

Strike Closes Fisher Plants

The strike spirit spreading through the plants of the Fisher Body Corp. following the walkout in the trimming and painting shop resulted in an order yesterday closing all that company's plants and the plant of the Anderson Electric Co., which makes bodies for Packard and other companies, is closed. The Automobile Body Co., which was closed on account of the strike, has been reopened with non-union labor. The strike in the body department at the Packard plant is regarded as responsible chiefly for the closing of that factory.

Everett Bros. plant will not be in operation for some time and consequently is not affected. Briggs Mfg. Co., which resumed operations on slightly under 50 per cent basis ten days ago, has not been affected by the strike. This company builds Ford bodies exclusively and now has about 1300 men working, though they admit operations are indefinite and believe the plant again will close unless operations start at the Ford factory soon.

No one seems even to guess what the Ford plans are, though the fact that the parts makers have been given no orders to start is regarded as significant and builders of Ford parts are a unit in expressing belief there will be no production there until after March 1. This situation was forecast at the time the plant went down Christmas Eve. The plant is practically idle. Only about 500 men are at work and they are employed solely in replenishing the parts stock.

Dodge Surplus Still Large

Dodge plans are equally mysterious. Dodge had a large surplus of cars in storage when production was stopped and although there has been some demand, especially in certain sections, the stock in the warehouses, in transit and in the hands of dealers, still is said to be large. President, F. J. Haynes said this week, no plans for reopening had been made.

Packard, which went down ten days ago, still is idle, and the 30-day maximum fixed by Vice-President Roberts as the shut down period will find the gates closed.

Reo this week went on a ten hour day full time schedule with the entire force working. Reo executives expressed confidence of continued improvement. The company delivered 1800 vehicles in January; 720 passenger cars and the balance speed wagons.

Paige reports renewed optimism among the dealers and a slight improvement in sales, though not sufficient to justify an increased production schedule and the plant will continue operation as at present—on about 25 per cent output.

There is no change at the Hudson-Essex factories. The Essex plant is still closed, but a small force is building both styles in the Hudson plant.

Cadillac was down the greater part of January and had comparatively no output, employees being used in building up the parts stock. They began on a schedule of 40 cars daily Feb. 1, but up to the present have not reached this schedule and are building about 25.

Maxwell-Chalmers plants are still idle awaiting outcome of reorganization efforts in New York.

Lincoln Sales Encouraging

Lincoln officials report encouraging outlook from the sales end, and a tendency toward improvement but the manufacturing schedules are not to be increased until such time as sales justify.

Oldsmobile is working full time building the new four and some eights but no trucks save on orders. Oldsmobile reports an encouraging outlook, but the present schedule of around 60 daily will be continued for the time being.

Briscoe is working 700 men full time

(*Continued on next page*)

Tractor Show Opens Wide Sales Avenue

Registration Admission System Proves Advantages—Foreign Machines Bid for Business

COLUMBUS, OHIO, Feb. 7—The six National Tractor Show, held under the auspices of the National Implement and Vehicle Association, was opened to the public in a range of eight buildings at the State Fair Grounds here this morning. The show is probably the largest that has ever been staged by any branch of the automotive industry, on the basis of floor space occupied.

By comparing the list of tractor exhibitors with a recent list of tractor makers it is evident that a very considerable number of the newer and smaller concerns are not represented. Forty-nine makes of tractors are shown, including three foreign makes, the Italian Fiat and the French Renault and Sonua, all three of which have been described and illustrated in AUTOMOTIVE INDUSTRIES.

Of the 49 makes eight are creeper tractors—the Holt, Best, Bates, J. T., Cletrac, Monarch, Hicks and Renault, and the rest wheeled types. It should be mentioned, however, that the Bates is now made in both a creeper and a wheeled type. The wheeled Bates, which is shown for the first time, is identical with the familiar "steel mule" from the front end back to the rear axle.

This year the management has broken loose from the time-honored practice of charging an admission fee, and it is hardly to be doubted that free admission will become the general rule in the future for industrial shows of products of an exclusively utilitarian character. The show management, of course, will lose quite some money from admissions, but, on the other hand, there are several important advantages to this scheme.

In the first place, the offer of a free admission will induce some prospects only as yet mildly interested in tractors, to attend, especially farmers located at moderate distances, and it is, of course, far more important to get these lukewarm prospects to the show than those already sold on tractor farming.

Buttons Identify Visitors

Then, each visitor on entering the show is compelled to register and give his business—whether he is a farmer, a dealer or an exhibitor—and after having registered he is given a button which admits him to the show, and the color of this button reveals his status.

Finally, when the show is closed on Saturday evening, the management will have an excellent all live list of tractor prospects which no doubt will be available to all members of the N. I. V. A. if not to all exhibitors, and after the different sales departments have finished their work on this list most of the prospects should have been converted into owners.

(*Continued on next page*)

Tractor Show Opens Wide Sales Avenue

New Models All Have Four-Cylinder Engines and Enclosed Drives

(*Continued from preceding page*)

The participation of European tractor manufacturers in the show is worthy of note and shows that some competition from that source must be expected in the future. This is the first time that European tractors have been offered for sale here. No doubt the fact that the great majority of the farms in Italy and France are so small that a tractor cannot be used on them to advantage is compelling these manufacturers to look for outlets elsewhere, and the recent business depression abroad may also have had something to do with the move.

It is difficult to discern any general new trends in tractor design. There are a considerable number of new farm tractors at the show and all of them are of the modern type with four cylinder engines, enclosed drive and generally clean design. Following is a list of the new machines with a brief outline of their characteristics; full illustrated descriptions of the more important designs being reserved for a future issue.

The Huber Mfg. Co. exhibits the Huber Super Four which has a Midwest engine, but is otherwise very similar to the Huber Light Four. It has a 15-30 hp. rating and the two speeds are 3 and 4½ m.p.h. A dry disk clutch is used.

The J. I. Case show a new 40-72 hp. tractor designed along the same lines as their smaller machines, and their complete line has now been revised on modern lines. This is the first time, so far as the writer knows, that a giant tractor, that is, one of more than five plows capacity, has been designed on strictly modern lines with a completely enclosed drive and none but cut gears running in oil.

A larger Twin City model, a 20-35 hp., similar in design to the Twin City 12-20, is being exhibited by the Minneapolis Steel and Machinery Co. The gears on this tractor are made of chrome nickel steel and are shrunk onto wheel centers, the drive being taken on splines on the centers and ring gears. This machine weighs 8500 lb.

Aultman-Taylor Makes Change

Several important changes in their 15-30 hp. model have been made by the Aultman-Taylor Machinery Co. One is the substitution of a drop forged I section axle for the built-up front axle and another the provision of a cross spring in front. A tubular radiator is now fitted and there is a brake acting on the belt pulley.

Several changes in equipment have been made by the Samson Tractor Co. An air washer is now fitted, located on the left side of the cylinder block. Two Hyatt bearings are mounted in each front wheel, and clutch control is provided so the clutch can be locked in position when doing belt work. The fan is now made with a double bearing, driven by a wide flat belt and provided with an automatic tensioning device. An impulse starter, a radiator shield and an exhaust pipe extending below the rear axle, have been added to the equipment. A large hand hole is to be provided in the gear case hereafter.

The Holt Mfg. Co. exhibited a snow removal tractor as sold to the City of New York, and tractors for the same purpose were shown by the Cleveland Tractor Co. and the Bates Machine & Tractor Co. The Holt concern also shows a large logging tractor with completely enclosed cab.

Revere to Operate Under Receivership

LOGANSPORT, IND., Feb. 7—The Citizens Loan & Trust Co. of this city has been appointed receiver for the Revere Motor Car Corp. by the Circuit Court of Cass County in a suit filed at Hammond by C. Edwin Osborn and other stockholders. Under the order of the court, the bank will keep the company's property intact and the plant in operation for a sufficient length of time to permit the stockholders to refinance the company.

A bankruptcy suit instituted recently against the Revere corporation was dismissed in Federal Court after a special master had declared the company solvent with assets of $1,157,328 and liabilities of only $354,659.

The Revere corporation has been made defendant in damage suits aggregating $548,000, filed in the Circuit Court here by the Revere Motor Sales Corp. of Delaware. The complaints allege breach of contract, disregard of court judgment and inability or neglect to make payments on cars sold.

The breach of contract suit asks for $450,000 damages. The disregard of court judgment suit seeks $25,000. The failure to make payments suit asks for $59,000, while a fourth suit asks for payment of $14,000, alleged to have been loaned to the local concern by the plaintiff company. Efforts for an amicable settlement of the case, started two months ago, have failed.

S. A. E. TO EXTEND RESEARCHES

NEW YORK, Feb. 9—The semi-annual meeting of the Society of Automotive Engineers will be held at the West Baden Springs Hotel at West Baden, Ind., May 24-28. West Baden was selected after a careful canvass of various places by the meetings committee.

Research work under the direction of a committee will be one of the major activities of the S. A. E. and an appropriation of $30,000 for this work was made by the council at its meeting in Chicago last week. This work is expected to become as important an activity of the S. A. E. as standardization has been and still is.

Manufacturers Hold Production Rate Low

Most Companies Get Good Reports of Show Activities from Distributors

(*Continued from preceding page*)

which is about one-third their regular force. Officials bring good reports and say dealers are confident of steady upward trend. The company was in production in January and will not increase their output during February but will start on a schedule of 30 daily March 1 and expect to increase this until a maximum of 75 daily is reached.

Studebaker, which opened Jan. 17, built 800 "big sixes" in Detroit. Their schedule was increased to 525 cars weekly Feb. 1.

Oakland is operating on a basis of 50 daily and striving to reach 50 per cent of normal, but officials do not expect to reach that point for 60 days. Good reports received from dealers at the show and a survey of the situation reveal less cars on hand than at the same time last year. It is reported that more Oaklands were sold during the last 90 days than were manufactured.

Buick built about 200 daily during January, and the same schedule will be maintained through February, despite the good show business and the optimistic views of dealers. March production schedules depend entirely on demand during February. The factory is working full time but with short force.

There was no production at the Willys-Overland or Willys-Knight plants during January, but they hope to clean up their surplus cars by March and resume production.

Dort this week began production of the new models and officials say they have orders ahead for 60 days. Vice-president Averill says the great interest manifested during the show indicates renewed buying, but thinks consumers will be more conservative and careful and does not look for a buying epidemic.

Saxon did not produce in January but began this week on a schedule of five daily.

The Jackson plant is working full time with about 25 per cent of its force and limiting production to actual sales requirements.

Hupp Employing 30 Per Cent

Hupp is employing about 30 per cent of its normal force and building about 20 cars a day. Hupp executives report the outlook good and President C. D. Hastings is enthusiastic over the shows.

President Sarver of Scripps-Booth said last week was the best the company has had in a long time from a sales standpoint. This applied to the Chicago show and the entire country. The company is operating with a short force and the schedule of about 10 a day will be maintained until the demand justifies greater production.

Reimported Trucks Sell at Low Price

Reconditioned Vehicles Built for French Army Sell Far Below List

NEW YORK, Feb. 8—Sixty-six trucks including Packards, Macks, Pierce-Arrows, Whites and Rikers, originally bought by the French Government and shipped to France and recently returned to this country, were sold at public auction at the L. & F. garage in Brooklyn here to-day by Samuel T. Freeman & Co., Philadelphia auctioneers. All of the trucks were fitted with standard Army types of bodies, and had seen some service, although some few had been driven less than 500 miles, according to the odometer readings and the appearance of the tires. The trucks had been on public exhibition out in the open for three days preceding the sale and were driven in singly for sale.

The consignment consisted of ten 2-ton Whites, ten 2-ton Packards and five 3-tonners, sixteen 4-ton Rikers, five 5-ton Pierce-Arrows and five 2-tonners, and fifteen 5½-ton Macks, all with cabs.

All of the trucks were bought "as is." Two of the 2-ton Whites, all of which were of 1918 models, were bought in at $1,300 and $1,325, respectively, by individual buyers with the remaining eight apparently bought in by an insider at $900 each. The 1918 list price of these trucks, without bodies, was $3,300.

The 2-ton Packards, some of which were equipped with generators for electric lighting, which listed at $3,200 in the chassis, were sold for a total of $13,200, or at an average of $1,320. The lowest selling bid was $1,225 and the highest $1,400. All of these Packards were bought by individual users whose business include shoes, chemical works, general trucking, iron dealer, farmer, builder, granite dealer, butcher and dye business. The five 3-ton Packards, which originally listed at $3,900, went for $10,850, or an average of $2,170. The lowest selling bid was $2,125, highest $2,275.

The first two of the 4-ton Riker trucks, which originally listed at $4,050, went for $2,050 and $1,150 respectively. The balance sold for $850 each.

Three of the 5-ton Pierce-Arrows, which listed at $5,000 in the chassis, went respectively for $2,225, $2,250 and $2,100. Two others went for $1,700 each. The first two of the five 2-ton Pierce-Arrows, originally listed at $3,300, went for $1,400 and $1,325 respectively, and the remaining three at $1,200 each.

The first of the 5½-ton Macks, which listed at $4,750, chassis, went for $2,450.

WILLIAM D. TREMAIN DIES

FORT DODGE, Feb. 4—William D. Tremain, 64, pioneer automobile dealer of Ford Dodge, died Feb. 1 following a serious illness. He was born in Strawberry Point, Iowa, and engaged in business in Fort Dodge in 1882. The firm of Tremain & Rankin, in which he was a partner with his brother-in-law, George F. Rankin, entered the automobile business in 1907, being the 43rd dealer in the State. He is survived by his widow and three children, George W. Tremain, Mrs. William Whalen and Mrs. Harold Sitting, all of Fort Dodge; a sister, Mrs. W. W. Stearns, Humboldt, Iowa, and a brother, H. J. Tremain, Minneapolis.

Bates Tractor Reduced to Price Before War

JOLIET, ILL., Feb. 5—Bates Machine & Tractor Co. has reduced its prices on tractors to pre-war levels. In a statement by Harry H. Bates, sales manager, the action was said to have been taken in the belief that new steel prices will justify the company in making a sacrifice of its present high-priced stock of materials.

In addition, he said, the demand for Bates tractors has grown to such an extent that increased production this year to meet new orders will result in a large cut in production costs. There is no good reason, he said, why a farmer buying a tractor for his spring work should not be able to do so as advantageously as the man buying for his fall work.

Orders for the present year are in greater volume than last year, he said, partly due to the enlarged dealer organization of the company. The principal reason for the increase, however, he declares, is the increased belief among farmers that tractor use means larger crops and a larger margin of profit.

Implement Men Deny Price-Fixing Charge

PHILADELPHIA, Feb. 4—Recent charges of price fixing, made against farm vehicle and implement retailers by the Federal Trade Commission, were vigorously denied by delegates to the Eastern Retail Implement & Vehicle Dealers Association at its ninth annual convention, in the Adelphia Hotel, this week. The convention has delegates from Pennsylvania, New Jersey, Delaware and Maryland. Grant White of this city presided.

Franklin Briggs, Woodbourne, Pa., who is the organization secretary, declared that the report of the Federal Trade Commission, charging the members of the association with a mutual agreement on prices and the barring of other merchants from entering the trade, by means of a boycott, is false.

JORDAN TO INCREASE OUTPUT

CLEVELAND, Feb. 9—Production at the plant of the Jordan Motor Co. will be increased 50 per cent on March 1, according to an announcement made at the annual meeting of stockholders of the company this week. The company expects to gradually increase production until it reaches normal. The directors re-elected were E. S. Jordan, T. E. Borton, Otto Miller, C. L. Bradley, W. B. Rily, R. S. Beggs and Paul Zens.

METAL MARKETS

REPORTS of scattered buying of modest tonnages by automotive interests are accompanied by rumors of price cutting. Youngstown district sheet mills are said to have booked orders for sundry lots of highly finished automobile sheets at 6.50c, quantities placed ranging from 50 to 250 tons. It is impossible to verify a statement that 5000 tons of black sheets have been booked by one of the rolling mills at $3 a ton below the prevailing quotations. So much is certain, however, that values are more flexible than they have been in some time and that producers are ready to discuss price, whenever representative tonnages are involved. One or two automotive foundries in Detroit have sent out market feelers and are expected to place orders for modest tonnages of pig iron in the next few days. In some of the Middle West automotive foundries, the opportunity that presents itself at this time for the weeding out of industrial slackers is being taken advantage of and furnishes another reason for slowness in pig iron buying. There is, however, a general feeling in the iron and steel markets that activity in the automotive industries is about to be presaged by a gradually increasing quota of buying for second quarter deliveries. In this impression producers are strengthened by the steadily growing number of specifications and shipping instructions that have been furnished in the last few days for tonnages, delivery of which had been temporarily "suspended" by the automotive buyers last Fall. An interesting development in connection with the opposition to the proposed increase of the tariff on imported aluminum to 7c a pound is the fact that one of the importing and brokerage houses has submitted to the Ways and Means Committee of the House of Representatives a cablegram from the largest aluminum producers in Norway, stating that, in their opinion, "if the tariff on aluminum is increased in this country, Norway will no doubt retaliate by increasing the import duty on automobiles."

Pig Iron.—While the nominal quotation for foundry pig is $30, foundry base, further recessions are generally anticipated. There are now in progress negotiations between the coke interests and the pig iron producers with a view to developing prices for pig iron that will induce buying on a more liberal scale.

Steel.—Strip steel producers report somewhat better inquiry from the automotive industries and, while so far only a very small amount of fresh business for the cold-rolled variety has been booked, the outlook is regarded as far more propitious. The Trumbull Steel Co., Warren, Ohio, is reported to have begun shipments on a large tonnage of sheets which were ordered suspended about two months ago by a leading Detroit passenger car interest.

Aluminum.—Relative firmness in the "outside" market which rules at 25c for virgin ingots, 98 to 99 per cent pure, is not due to a better demand but rather to anticipation on the part of holders and importers that not only will there be an early resumption of buying, but that possibility of an increased duty offers a chance for increased profits on what stock is in hand at the time such augmented duties might be put into effect.

Copper.—The financing plans of some of the large copper interests who contemplate the issuing of debenture bonds with their accumulations of "red metal" as the security, are interpreted by many domestic consumers as an additional sign of intensive weakness

FINANCIAL NOTES

Rolls-Royce of America is now on production of about one car daily. Net earnings of about $20,000 accrued to the American company during 1920 from sale of British-made chassis. Orders for 75 chassis are on the books of the American company, the price being $11,500, on each of which a profit of about $2,000 will be made. The only part brought here from England will be a brake member, made of material impossible to obtain in this country.

Firestone Tire & Rubber Co. showed an increase of $10,304,338 in its inventory of Jan. 1, 1921, over the $26,969,535 inventory of Jan. 1, 1920. Materials on hand, in transit and in process Jan. 1, 1921, were valued at $21,168,140, compared with $11,217,872 on Jan. 1, 1920. Finished goods on Jan. 1, 1921, were valued at $16,105,733, compared with $15,751,662 the year previous.

Gardner Motor Co., Inc., in a statement as of Dec. 31 reports resources of $2,348,554 included, in which is merchandise valued at $1,510,230 and cash of $290,759. A profit and loss deficit of $1,044 is shown. The company has no current liabilities and no borrowed money. The company will continue operations along conservative lines.

Detroit Machine Tool Co. has increased its capital from $150,000 to $300,000, to permit of plant expansion in order to take care of production of ten automotive parts, for which a special department has been equipped.

Mullins Body Co., in a financial statement issued Dec. 31, reports net sales of $3,711,420 and a net profit of $701,290. Assets increased from $2,191,196 on Oct. 31, 1919, to $4,500,056 on Dec. 31, 1920.

Harley-Davidson Motor Co., in a balance sheet as of Oct. 1, 1920, shows current assets of $1,823,982; current liabilities, $1,147,964; P. & L. surplus, $5,174,850; total assets and liabilities, $8,728,187.

North Baltimore Tractor & Machine Co. of North Baltimore, Ohio, has declared a dividend of 10 per cent and has increased its capital from $50,000 to $100,000.

Galion Metallic Vault Co., which owns and controls the Ditweiler Mfg. Co., has increased its capitalization from $400,000 to $1,000,000.

Cotta Creditors Name Trustee for Company

ROCKFORD, ILL., Feb. 8—The Rockford Trust & Savings Co. has been selected as trustee for the bankrupt Cotta Transmission Co. Two groups of creditors voted upon the question of trustee, the minority favoring the Central Trust Co. of Chicago. It was shown that ninety-four creditors, representing $349,263, supported the Rockford Trust company, while eight-nine creditors, representing $337,403, favored the Chicago company.

At the hearing of the officers, President T. D. Reber, Vice-President E. P. Reber, and A. D. Scoville, the secretary-treasurer of the Cotta company, testified concerning the financial condition of the company. Chicago attorneys endeavored to establish proof that the officers had exerted their influence upon creditors to secure their support of the Rockford trustee. Rockford creditors naturally preferred a home concern to one from abroad. Evidence brought out by the examination of the officers into the cause for the failure showed the prime factors:

First, The change of production from a three-speed transmission to a four-speed, to meet the requirements of pneumatic tired and faster moving trucks.

Second, Firms holding contracts placed by the Rockford company for jigs, tools, and special fixtures and forgings, stampings and other material required, were from one month to one year behind in keeping their promises to deliver the necessary material for production .

Third, General slowing up of business in the entire automotive field in the early spring of 1920, with the result that many orders were canceled and others held up indefinitely.

Harrison Takes Control of Abrasive Corporation

BOSTON, Feb.7—Nathan C. Harrison, who has been president of the International Abrasive Corp., has taken over control of the company and an entirely new board of directors has been elected. The corporation now owns the Harrison Supply Co. of Boston, the National Abrasive Co. of Amesbury, Mass., and Niagara Falls, Ont.; the Superior Corundum Wheel Co. of Waltham, Mass., and the Dominion Abrasive Wheel Co. of Mimico, Ont. The offices have been consolidated here.

Harrison is president and general manager of the company and Fred M. Lamson, a vice-president of the Old Colony Trust Co. of Boston, is secretary and treasurer. The directors include B. A. Brennan, president of the Fidelity Securities Corp. of Baltimore; Lawrence Chamberlain of New York, banker; Edward S. Foster, treasurer of the Carr Fastener Co. of Cambridge, Mass.; Charles G. Schirmer of Boston, banker; Frank D. White, head of the Lincoln Oil works, Rutland, Vt., and A. J. Sunstein of Pittsburgh.

RECEIVER NAMED FOR WIZARD

CHARLOTTE, N. C., Feb. 7—C. J. Bragg has been appointed receiver for the Wizard Automobile Co., Inc., by Judge Harding in the Superior Court here. The advertising of the company was condemned a short time ago by the national vigilance committee of the Associated Advertising Clubs of the World, which declared that the Wizard company had claimed enormous dividends before it had built a single car.

DEFIANCE ELECTS OFFICERS

DEFIANCE, OHIO, Feb. 7—At the annual meeting of the Defiance Motor Truck Co. the following were elected as officers and directors: C. H. Kettenring, president; J. C. Ayers, vice-president and general manager; Charles Behringer, vice-president and works manager; H. R. Morse, secretary, and J. F. Robertson, treasurer. Frank W. Warrington, general sales manager, was also elected a member of the board.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, Feb. 10—January failures were larger than for any month since January, 1916. The number of commercial failures at 1.895 showed an increase of 370 over the failures for December. The liabilities involved, however, at $52,136,631 compare with the record total of $58,871,539 of December. In other words, while the number of failures increased over 24 per cent, the total liabilities decreased nearly 11½ per cent. This would seem to indicate that the smaller firms are experiencing greater difficulties in readjusting themselves to the new conditions.

Wholesale prices in January, as indicated by Dun's compilation, declined 6.4 per cent, as against a decline of 6.2 per cent in December.

The local loan market last week became very firm, especially in the call market where call money reached 8 per cent last Monday and 9 per cent on Wednesday. The range for the week was 7 per cent to 9 per cent, as against a flat 7 per cent the week before. The time money market was very quiet, but with nominal quotations slightly higher. A rate of 7 per cent was quoted for sixty to ninety days' and four months' paper, and 6¾ per cent for five and six months' paper. The week before, the uniform rate of 6½ per cent was quoted for all maturities.

The increased number of capital issues and withdrawals of funds from this center by the Government and interior districts are said to have been partially responsible for the tightening of the market. Anticipation of further Government and corporation bond issues is probably also an influencing factor. The Federal Reserve Bank announced last week that henceforth it will charge 6 per cent on notes discounted and secured by United States Treasury certificates of indebtedness.

The excess reserves over legal requirements of the New York Associated Banks increased $6,221,920 last week, while loans increased $3,085,000, and net demand deposits declined $868,000.

The week-end statement of the New York Federal Reserve Bank revealed a condition which was more or less expected in view of the tight money market. While gold reserves increased $4,220,000 and total reserves $5,414,000, total earning assets also increased $17,390,000. Total earning assets at $1,015,430,799 were again over the $1,000,000,000 mark. Net deposits increased $13,737,000. Contrary to the general trend, Federal Reserve notes in this district increased $8,746,000, marking the first increase since Christmas week. Consequently the reserve position of the bank was less favorable than it was a week ago.

The reserve position of the Federal Reserve banks as a whole again showed improvement.

MEN OF THE INDUSTRY

C. O. Miniger, vice-president of the Willys Corporation and general manager of the Auto-Lite division at Toledo, has been named to succeed J. Allan Smith as president of the United States Light & Heat Corp. Smith resigned to head a company which will manufacture the Nera car, a light-weight commercial vehicle designed by Carl Neracher. Miniger was one of the incorporators of the Electric Auto-Lite Co., and has been closely identified with the manufacture and sale of electric devices for motor cars for many years.

F. H. Ayers has been appointed director of sales of the Fisk Rubber Co. He has been sales manager for the past four years and has completed seventeen years of service with the company. William Wield has been promoted to the position of sales manager, and C. H. Gage and L. N. Southmayd have been appointed assistant sales managers. K. S. Chamberlain has been appointed manager of export sales.

D. H. Kelly has been elected president and assistant general manager of the United States Light & Heat Corp. to succeed C. L. Lane, resigned. Kelly for the past eight years was secretary of the Toledo Scale Co. and for the past two years has held the office also of assistant sales manager of the Willys light division of the Electric Auto-Lite Corp.

Frank J. Flynn has been appointed service manager for the Connecticut Telephone & Electric Co. He has been for several years with the Connecticut company in the field, both among service stations and jobbers. I. L. Doolittle, who has been service manager for the past two years, joins the sales division of the company.

Albert A. Franklin has become a member of the automotive department of the Byron G. Moon Co., Troy, N. Y. He was for two years advertising manager of the Haynes Automobile Co., and later acted as assistant advertising manager of the Waverly Company.

H. D. Bennett, assistant cashier of the Capital National Bank, Lansing, Mich., will leave that institution March 1 to become secretary-treasurer of the Garlock Sales Co. Bennett has been an official of the sales company for some time and has been nominal secretary-treasurer.

S. B. DeReatchi, export manager of the Miller Rubber Co., has resigned to accept a similar position with the Quaker Rubber Co. DeReatchi formerly was a colonel in the Mexican army under Carranza and also served as attache of the Mexican embassy in New York.

L. K. Cooper, for some time assistant to the general manager of sales of the Chevrolet Motor Co., New York, has been appointed sales manager of the Chevrolet Motor Co., of Illinois, with offices in Chicago. H. H. Mundy, formerly Chicago sales manager, has been transferred to Kansas City.

C. C. Smith, who has been assistant secretary and manager of the American Petroleum Industries for the past two years, has resigned and on Feb. 15 will take charge of the New York territory for the James Berry's Sons Co., oil jobbers.

L. M. Klinedinst has been appointed assistant sales manager of the Timken Roller Bearing Co. He has been connected with the company for sixteen years, serving last as manager of the tractor and farm implement division of the sales department.

Arthur P. Hawes has joined the organization of F. E. Wing, Marmon distributer in New England, as sales manager. Hawes was at one time manager of the Locomobile in Boston and later became manager of the Philadelphia branch of the same company.

R. G. Schulze, who has been head of the export department of S. F. Bowser & Co., Inc., manufacturers of gasoline pumps and tanks, has been appointed chief executive of the concern in England with entire supervision of the company's affairs in Europe.

E. A. White has been elected president of the American Society of Agricultural Engineers. He is the holder of a degree of doctor of agricultural engineering bestowed by Cornell University.

R. I. Pierce has resigned as production manager for the Gramm-Bernstein Motor Truck Co. to handle sales and supervise installations in the outlying sections for the Holland Furnace Co., Lima, Ohio, branch.

Thomas Calloway, assistant aeronautical manager of the Goodyear Tire & Rubber Co., has resigned to enter business in Chicago. Calloway was in charge of the Goodyear exhibit at the California aeronautical exposition.

C. A. Erickson has resigned as general manager of the Standard Radiator Co., Springville, N. Y., to enter the sheet metal automotive parts business. Erickson also was formerly chief engineer of Scripps-Booth.

A. R. Sadler, service manager of the Goodyear Tyre & Rubber Co. of Great Britain, Ltd., has sailed for London after a series of conferences with officials of the main Goodyear offices in Akron.

Newton Noble, for seventeen years head of the development department of the B. F. Goodrich Co., has resigned. Noble has made no announcement of his contemplated future connections.

S. T. Thompson has succeeded J. K. Cravens as director of sales of the Duplex Engine Governor Co., Inc., Brooklyn, N. Y. George L. Ritter will be assistant director of sales.

E. Hunn, Jr., assistant to President E. H. Hare of Hares Motors, has been made general manager of the Enterprise Motor Corp., New York distributor of Kelly-Springfield trucks.

John P. Franck has been appointed sales manager of the Ditweiler Mfg. Co., Galion, Ohio. He will also continue his connection with the Guide Motor Lamp Co.

T. W. Van Sickle has resigned from the sales force of the New Departure Mfg. Co., effective March 1. He has not announced future plans.

L. J. Ollier, export manager of the Studebaker Corp., has sailed for Europe on a business trip and will return about May 1.

MAURICE J. MOORE DIES

INDIANAPOLIS, Feb. 7—Maurice J. Moore, secretary-treasurer of the LaFayette Motors Co., died at St. Vincent's Hospital, Feb. 1, following an operation on a dislocated knee with which Mr. Moore had been troubled ever since his college days, when he injured it in a football game. He had lived in Indianapolis since coming here with the LaFayette Motors Co. in August, 1919. He was also president of the LaFayette Building Co., formed for providing homes for workmen of the motors company near the plant.

Mr. Moore formerly was with the Chevrolet Automobile Co., at Detroit and Flint, Mich. During the war he served as a major in the Motor Transport Corps.

INDUSTRIAL NOTES

Transport Truck Co. is completing a new storage dock that will add materially to the facilities for handling the company's business. The dock is 90 by 240 feet and has a total floor space of 2600 feet. The addition permits a complete switch track system operated on either side of the building and facilities for export crating are included.

Wright Carriage Body Co., Moline, Ill., has been changed to that of the Moline Body Corp. Originally opened for the manufacture of carriage bodies, the company has dropped this line and is now manufacturing bodies for motor vehicles.

Baker-Galva Tractor Co., organized last fall and which planned to erect a manufacturing plant in Galva, Ill., has abandoned the proposition and will go to Decatur, Ill., instead. Adequate financing is promised in Decatur.

Austin Machinery Corp. of Louisiana has been incorporated with a capital of $100,000 preferred stock and $200,000 common, to distribute in four southern states the products of the Austin Machinery Corp.

Reed-Prentice Co. plant, Worcester, Mass., will house the executive departments of that company, the Becker Milling Machine Co., and the Whitcomb-Blaisdell Machine Tool Co., after Feb. 21.

Northern Trailer Co., a subsidiary of the Bangor Motor Co., has begun manufacture of trailers, sleds, snow plows, etc., at South Orrington, Me.

Master Tire & Rubber Co. has elected as directors, George H. Kramer, George Marshall, Jr., and Edward Luthman.

American Auto Accessories Co., Denver, has changed its name to the Sewell Mfg. Co.

Liquidation Sought of Interlocking Tire

AKRON, Feb. 8—Following several conferences, creditors and stockholders of the Interlocking Cord Tire Co. have practically abandoned all attempts at reorganization of the company and have again petitioned the Common Pleas Court to name a permanent receiver so that liquidation may proceed. The reorganization plan was the outgrowth of offers made by President Walter Kline, Secretary C. E. Foust, Sales Manager J. W. Rinear, and Treasurer L. W. Rinear, to resign. All four are under criminal indictment for alleged violation of the Ohio Blue Sky law.

According to Elihu Harpham, temporary receiver, the company's direct liabilities are $150,000 and contingent liabilities will range from $50,000 to $150,000, with known assets not to exceed $125,000.

CASE PLOW ON 3-DAY WEEK

RACINE, WIS., Feb. 7—To aid workers to overcome the effects of a period of unemployment, the J. I. Case Plow Works Co., on Feb. 1 instituted a schedule of operation of three days per week. Preference is being given to married employes and single men supporting others. Several other large industries in Racine are following a similar plan. The recent Federal survey of industrial conditions gave Racine a total of 7000 out of work.

Calendar

SHOWS

Feb. 12-19—Hartford, Conn., Annual Automobile Show, Hartford Automobile Dealers Ass'n, Armory, Arthur Fifoot, Mgr.

Feb. 12-19—Kansas City. Annual Automobile Show, Kansas City Motor Car Dealers' Ass'n.

Feb. 14-19—Winnipeg, Western Canada Automotive Equipment Show.

Feb. 18-28—San Bernardino, Cal., National Orange Show, Fred M. Renfro, Mgr.

Feb. 19-26—San Francisco, Fifth Annual Pacific Automobile Show, Exposition Auditorium, George Mahlgreen, Mgr.

Feb. 21-26—Louisville, Annual Automobile Show, Louisville Automobile Dealers Ass'n, First Regiment Armory, C. L. Alderson, Secy'.

Feb. 21-26—Salt Lake City, Annual Automobile Show. Intermountain Automotive Trades Ass'n, W. D. Rishal, Mgr.

Feb. 26-Mar. 5—Buffalo, Annual Automobile Show, Buffalo Automobile Dealers Ass'n, 74th Regiment Armory, C. C. Proctor, Mgr.

Mar. 2-10—Des Moines, Annual Automobile Show, Coliseum, C. G. Van Vliet, Mgr.

Mar. 5-12—Atlanta, Annual Automobile Show, Atlanta Automobile Dealers' Ass'n, Auditorium, Virgil Shepard, Mgr.

Mar. 5-12—Brooklyn, Annual Automobile Show, Brooklyn Motor Vehicle Dealers' Ass'n, 23d Regiment Armory, George C. Lewis, chairman.

Mar. 5-12—Pittsburgh, Annual Automobile Show, Automotive Ass'n, Inc., Motor Square Garden, J. J. Bell, Mgr.

Mar. 5-12—Atlantic City, Annual Automobile Show, Automobile Trade Association of Atlantic City, Million Dollar Pier, A. H. Generatzky, Mgr.

Mar. 7-12—Syracuse, N. Y., Annual Automobile Show, Syracuse Automobile Dealers Ass'n, Armory, Howard H. Smith, Mgr.

Mar. 7-12—Indianapolis, Annual Automobile Show, Indianapolis Automotive Trade Ass'n, Automobile Bldg., State Fair Grounds, John Orman, Mgr.

Mar. 12-19—Boston, Annual Automobile Show, Mechanics Bldg. and South Armory.

Mar. 14-19—Omaha, Annual Automobile Show, Omaha Automobile Trade Ass'n, Inc., Omaha Auditorium, C. G. Powell, Mgr.

Mar. 14-19—Washington, Annual Automobile Show, Washington Automobile Dealers' Ass'n, Rudolph Jose, Chmn.

Mar. 19-26—Detroit, Annual Automobile Show, Detroit Automobile Dealers' Ass'n, Morgan-Wright Building.

April 3-9—Denver, Annual Automobile Show, Auditorium.

April 4-9—Seattle, Annual Automobile Show, Seattle Motor Car Dealers' Ass'n, Arena Hippodrome.

April— Chattanooga, Tenn., Spring Automobile Show, Chattanooga Automotive Trade Ass'n, Sunday Tabernacle, C. A. Noone, sec'y.

FOREIGN SHOWS

Mar. 23-28—Witwatersrand Agricultural Show including machinery and motors sections.

April, 1921—Sofia, Bulgaria, Tractor Trials, under the Bulgarian Ministry of Agriculture.

May 28-June 8—International Automobile Exhibition, Basle, Switzerland.

June, 1921—Reykjavik, Iceland. Agricultural Exhibition—Agricultural Machinery—Icelander Agricultural Society, Reykjavik, Iceland.

October—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

CONVENTIONS

May 4-7 — Cleveland, National Foreign Trade Council.

Oct. 12-14, 1921—Chicago, Twenty-Eighth Annual Convention National Implement & Vehicle Ass'n.

Champion Is Elected to Head Old Timers

CHICAGO, Feb. 4.—The Old Timers' Club, which was a more or less informal and spontaneous organization originated a year ago in the office of the Standard Parts Co., in Cleveland, assumed definite form this week at the first annual dinner of the organization at the Congress Hotel.

After a year of button-wearing and rapid growth officers were elected, and the organization formalities are to be completed by a committee. Albert Champion of the Champion Ignition Co., Flint, was chosen president. He came to America twenty-one years ago from France, a professional bicycle rider, and has been a part of America's automobile industry ever since.

Clifford Ireland, member of Congress, was toastmaster. Addresses were made by David B. Beecroft, directing editor of the Class Journal papers; Forrest J. Alvin of the United States Motor Truck Co., Cincinnati, and Samuel E. Hibben, attorney, Chicago. The officers follow:

President—Albert Champion, Champion Ignition Co. Vice-Presidents—Passenger car section, Howard Marmon, Nordyke & Marmon Co.; motor truck section, Martin L. Pulcher, Federal Motor Truck Co.; parts and accessories section, John Younger, Standard Parts Co.; jobbers' section, Gregory Flynn, Edward A. Cassidy Co., New York; distributors' section, W. L. Hughson, San Francisco; dealers' section, Thomas J. Hay, Chicago; newspaper section, Walter Bermingham, *Chicago Evening Post;* automobile publication section, C. G. Sinsabaugh, *Motor Life;* contest section, Richard Kennerdell, chairman, contest board, A. A. A.; organizations section, Alfred Reeves, general manager, National Automobile Chamber of Commerce; advertising section, Lloyd R. Maxwell, Erwin Wasey & Co., Chicago. Secretary—F. Ed. Spooner, Detroit. Treasurer—H. S. Firestone, Firestone Tire & Rubber Co.

McCord Creditors to Guard Interests

DETROIT, Feb. 9—Creditors of the McCord Mfg. Co. will meet Friday to select an advisory committee to take charge of the company's affairs to guard against any action which might prove detrimental to the interests of both the company and creditors.

A letter announcing the meeting was sent out over the signatures of ten banking creditors headed by Frank G. Smith, vice-president of the First and Old National Bank, Detroit. The concern lists total assets as of Dec. 31 of $11,700,000 to pay quick liabilities of about $500,000 accounts payable and $1,900,000 long term bonds. They are confronted with large inventories and accounts receivable, which they are unable to convert quickly into liquid assets. The letter says the inventories are reduced to prices which would be salable when the demand revives, but the customers' contracts are on a basis of higher prices.

PEUGEOT TO BUILD HERE

NEW YORK, Feb. 7—The Peugeot Automobile Co. of France will form an American company to be known as the Peugeot Company of America, with an authorized capital stock of $3,000,000 8 per cent cumulative preferred, and 50,000 shares of common stock of no par value. The company will manufacture Peugeot cars at a plant to be located in New England. Of the stock, $1,500,000 preferred and 25,000 common shares will be issued at once.

Mexican Development Opens Way to Tractors

NEW ORLEANS, Feb. 7—The Department of Fomento (development) of the Federal Government of Mexico, which has been supplying agricultural implements and seeds at cost to farmers of small tracts throughout that country, also is now prepared to handle tractors, motor trucks and other automotive farm and road-building machinery, likewise at cost, for other and larger farmers who may order it through that department, according to Arturo M. Elias, the new consul-general of Mexico, who arrived at his headquarters in New Orleans, Feb. 1.

"I would suggest," said Consul Elias, "that tractor and truck manufacturers wishing to get a foothold in Mexico, communicate with the Department of Fomento as to the placing of their automotive machinery. Such letters may be made in English, and should be addressed to the Secretary of the Department of Fomento, who is a minister in the President's cabinet. The Mexican government owns and operates the Compania Naviera Mexicana, which now has nine steamers in operation between New Orleans and Mexico, and the agricultural machinery will be handled from ship-side, at New Orleans, the government taking it from the hands of the manufacturer at that point. More than 20,000 persons have returned to agricultural pursuits since the new government of Mexico came in, and the need for these implements is great."

RANGER TRUCK ADVANCED

HOUSTON, TEX., Feb. 7—Price of the Ranger truck, model TK-22, has been increased from $2575 to $2875 by the Southern Motor Mfg. Assn., Ltd., of this city.

AUTOMOTIVE INDUSTRIES
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Revised Registration Figures Show Trend of Sales

Analysis of the 8,932,458 registrations shows sales possibilities of the Southern States just beginning to be developed. Agricultural States have largest number of cars per capita, but still form large market.

THE annual registration article, published in AUTOMOTIVE INDUSTRIES of Jan. 13, stated that there were 8,887,572 cars and trucks registered in the United States, and announced at that time, a later revision of these figures. This article presents these revisions, made after careful checking with the final records of the various secretaries of state. A discussion of the various conclusions which may be drawn from the statistics was also promised in the Jan. 13 number, and is included in the present article.

The revised figures given in this article show accurately the number of cars registered in the various states. Few changes are to be noted in the revised figures, except in the case of Florida, the figures for which were not available in time for the previous publication and had to be estimated.

The revised total registrations is still closer, however, to the nine million mark, 8,932,458 cars and trucks being registered in the United States during 1920. The total in each case comprises the registrations as of Dec. 31, 1920. This is an actual increase of 1,335,955, or 15.65 per cent over 1919. There is one car for every 11.84 persons.

The total fees for the year ran well over $98,000,000, thus making available a large sum of money for road maintenance and improvement. This is nearly $30,000,000 more than was paid into the various state treasuries during the previous year in license fees. A reliable computation states that 92 per cent of these fees are devoted to highway work and 8 per cent to administrative work.

For purposes of sales analysis, the country logically divides into four sections, industrial rather than sectional, except in the case of the Southern States. This division is as follows:

1—Agricultural States.
2—Manufacturing States.
3—Mining States.
4—Southern States.

Viewing the registration from this standpoint permits an analysis of the automotive market as well as of the trend of sales during recent years.

The States included in these sections are as follows:

1—Manufacturing States:
Massachusetts, New York, Pennsylvania, Michigan, Indiana, Delaware, Connecticut, Rhode Island, New Jersey and Wisconsin.

2—Agricultural States:
Arkansas, North Dakota, South Dakota, Kansas, Minnesota, Nebraska, Oregon, Oklahoma, Texas, Washington and Iowa.

3—Mining States:
Wyoming, Nevada, Utah, Montana, Colorado, Arizona, Idaho and New Mexico.

4—Southern States:
Florida, Georgia, Virginia, North Carolina, South Carolina, Kentucky, Tennessee, Louisiana, Mississippi, Alabama, West Virginia.

As would be expected the manufacturing states show the largest total registration. The totals for the sections for 1920 are:

Manufacturing States	3,607,750
Agricultural States	2,468,093
Mining States	374,106
Southern States	1,084,050

This shows that about half of the total number of cars and trucks in use are concentrated in the big manufacturing states. This proportion corresponds in a general way with the proportion of population concentrated in these sections. The population of the manufacturing group according to the 1920 census figures is 43,308,991, while the total for the three other groups is 49,111,684.

Relative Density of Automobiles

A comparison of the relative density of automobiles in the various sections brings out more definite trends. The chart shown in Fig. 1 presents the course of registrations per capita since 1912. The curve shows graphically the trend of sales resistance during the last ten years.

In 1912, it will be noted, the manufacturing states were far ahead in the proportion of cars registered. At that time the manufacturing states had one car for every 80 persons, while the agricultural states lagged far behind with one car for every 140 persons. This state of affairs was natural since selling effort was much easier in cities than in the rural districts. Even though there was a potential market for cars on the farms at that time, it was not cultivated since large sales were to be made with less effort in the cities.

The same thing applies to sales in the mining states at that period, while the Southern States were behind probably for much the same reason in 1912. In this later case, however, the lack of good roads should probably be added as a reason, since the South contained sufficient urban areas to present in many cases a concerted group of potential buyers for selling effort.

Following the curve through succeeding years, the increased sales resistance in the large cities and more congested areas of the manufacturing states becomes apparent, together with the consequent development of the farm market. The years 1912 to 1915 each recorded an enormous percentage of gain in the agricultural states, while the number of persons per car did not seek a low level as rapidly in the better supplied manufacturing areas.

Registration of Motor Vehicles

State	Total Net Registration	Non-Resident and Re-Registration	Passenger Cars	Commercial Cars	Motorcycles	Chauffeurs and Operators	Total Fees
Alabama	74,637	3,123	61,941	12,696	1,035	.....	$832,980
Arizona	34,559	1,816	29,826	4,733	542	416	192,245
Arkansas	59,082	333	.....	.....	.....	478	591,465
California	568,892	126,827	534,814	34,078	20,047	865,699	5,554,265
Colorado	128,951	10,881	121,223	7,728	3,364	9,814	818,938
Connecticut	119,134	.....	95,123	24,011	6,543	.....	1,561,191
Delaware	18,300	.....	.....	.....	674	.....	329,980
District of Columbia	9,712	.....	8,403	790	519	7,468	54,231
Florida	73,914	.....	63,466	10,448	1,275	2,190	554,695
Georgia	144,422	2,028	.....	.....	1,688	5,147	1,918,512
Idaho	50,873	851	.....	.....	764	802	882,050
Illinois	568,759	.....	503,762	64,997	10,597	63,451	5,897,879
Indiana	332,707	.....	300,226	32,481	8,823	9,758	2,029,103
Iowa	437,300	97,908	.....	.....	4,000	.....	7,507,202
Kansas*	265,396	5,903	248,322	17,074	2,972	.....	1,498,924
Kentucky	112,685	.....	99,426	13,259	1,543	5,000	816,159
Louisiana	66,000	.....	59,400	6,600	500	.....	39,600
Maine	62,907	4,636	55,395	7,512	1,566	78,539	818,756
Maryland	116,341	9,960	104,909	11,432	7,332	54,269	2,124,925
Massachusetts	304,631	35,346	253,245	51,386	15,143	361,579	3,860,232
Michigan	412,717	35,640	366,946	45,771	8,011	74,648	5,694,486
Minnesota	65,517	2,389	.....	.....	1,158	3,497	155,985
Mississippi	63,484	834	58,502	4,765	194	194	127,627
Missouri	296,919	16,400	.....	.....	3,954	26,791	2,111,697
Montana	60,646	862	59,450‡	1,200‡	675	.....	415,383
Nebraska	223,000	.....	204,000	19,000	2,000	.....	2,070,144
Nevada	10,464	.....	.....	.....	141	.....	.....
New Hampshire	34,680	4,800	30,240	4,440	2,542	44,093	645,968
New Jersey	227,737	41,351	204,125	23,612	11,041	294,438	3,503,937
New Mexico	22,109	.....	.....	.....	219	.....	200,000
New York	669,290	.....	521,417	148,873	29,453	358,022	8,511,597
North Carolina	140,860	.....	127,415	13,455	1,418	.....	1,785,000
North Dakota	90,840	10,164	89,385	1,455	898	.....	691,510
Ohio	615,397	16,000	533,879	81,518	26,956	.....	5,846,042
Oklahoma	204,300	.....	.....	.....	1,320	.....	2,393,788
Oregon	103,790	15,946	.....	.....	3,516	3,963	2,085,000
Pennsylvania	570,164	72,545	521,835	48,329	23,981	258,135	.....
Rhode Island	50,375	5,772	40,800	9,575	2,225	58,710	531,000
South Carolina	92,818	1,933	.....	.....	908	.....	527,868
South Dakota	120,395	2,410	112,589	7,806	777	.....	768,000
Tennessee	101,852	.....	90,214	11,638	1,151	.....	1,215,776
Texas	427,693	.....	.....	.....	4,293	23,385	3,510,356
Utah	42,578	.....	37,016	5,553	1,114	1,120	350,938
Vermont	31,625	.....	.....	.....	946	33,817	555,422
Virginia	134,000	10,000	101,800	13,670	2,233	5,520	1,825,000
Washington†	173,920	13,337	147,170	26,750	4,915	.....	2,828,896
West Virginia	78,862	6,000	68,162	10,700	1,659	10,514	1,100,000
Wisconsin	293,298	.....	277,093	16,205	8,002	.....	3,127,073
Wyoming	23,926	.....	.....	.....	327	.....	267,179
TOTALS	8,932,458	555,995	6,131,519	793,540	234,954	2,636,156	$91,025,398

*Registration year ends July 1. Figures for Jan. 1 †Estimated. ‡Figures as of December 1.

This action continued until 1917, when the agricultural states finally showed fewer persons per car than the manufacturing states, while the mining states passed the manufacturing during the same period and even slipped down below the agricultural states by a slight margin.

This relation has been preserved to a large extent in the 1920 figures, which show the number of persons per car in these sections as follows:

Agricultural States	8.10
Mining States	8.90
Manufacturing States	12.00
Southern States	20.08

Market in Southern States

During this entire period the Southern states have consistently lagged behind. This fact, together with the changes noted in the three other curves, would indicate that intensive sales effort has not yet been directed to the states comprised in this group. But as the number of persons per car becomes lower in the three other groups it is apparent that sales resistance will increase accordingly.

And at a time when sales resistance is particularly acute for a variety of reasons, unconnected with this factor, it would seem necessary in the near future seriously to study the possibility of intensively cultivating that market which, in one phase at least, offers less sales resistance.

The slow progress in the Southern states, of course, can be attributed to several factors:

1—Roads in this section of the country are not nearly as good as in the States comprised in the other groups.

2—A large negro population, most of which does not comprise a market for automobiles, makes the figures for this group of States somewhat higher than it would be if only potential automobile buyers were included.

3—Lack of educational facilities and popular education as compared with the North. Automobile sales increase as the general level of education rises.

To make a detailed analysis of the Southern market for any particular make of car would involve the consideration of a number of important factors besides the mere registration figures. The number of cars registered, however, form a sound indication of certain trends and can well be used as a foundation upon which to base a more detailed analysis of this large potential market.

In this connection, it is well to note that the development of a good used car market among certain parts of the population of the South may form the basis of a future market for new cars. One dealer tried this in a certain section, and found the colored population to be large buyers of used cars. This particular dealer was able to absorb the used cars of a particular make from several territories in his vicinity.

With $11,099,617 collected in motor fees during the last year, nearly all of which should be available for road maintenance, the roads in this Southern group should be well kept up. That is one of the greatest barriers to automobile and truck sales is being rapidly broken down, thus rendering this section the next logical area for intensive sales cultivation. The latest federal figures show that $92,500,000 will be spent on roads during 1921 alone in this group of states, about 15 per cent of the entire amount to be spent in 1921 throughout the United States.

Ohio Shows Large Gain

The gain in registration showed by Ohio is particularly noteworthy, since this state was near the top in total registrations even in 1919. For such a state to lead all the rest in actual gain is unusual at this stage of the business. New York, for instance, which leads in total registrations both in 1919 and 1920, is in second place in actual gain, while Pennsylvania, which has the third largest registration total, is in sixth place as regards actual gain.

In other words, Ohio is making more rapid strides than any of its close competitors in the race for first place. Of the states that are high up in the population scale, Ohio has the greatest number of cars per capita. Taking only those states whose population is four million or more, the number of persons per car is as follows:

Ohio	9.38
Texas	10.91
Illinois	11.41
Pennsylvania	15.45
New York	15.52

Thus it appears that Ohio, although a thickly populated industrial state, has already absorbed many more cars per person than any other similar state. Only two other manufacturing states surpass it in this respect, Michigan and Wisconsin, neither of which has nearly as large a population.

Large Gains By Large States

As might be expected, however, the largest states have made the greatest actual gain in registration during the last year. The five leaders in actual gain are as follows:

Ohio	104,366
New York	97,628
Texas	96,383
California	91,442
Illinois	90,321

Agricultural States Lead in Cars Per Capita

None of the first thirteen states in the list of cars per capita is classed as a manufac-

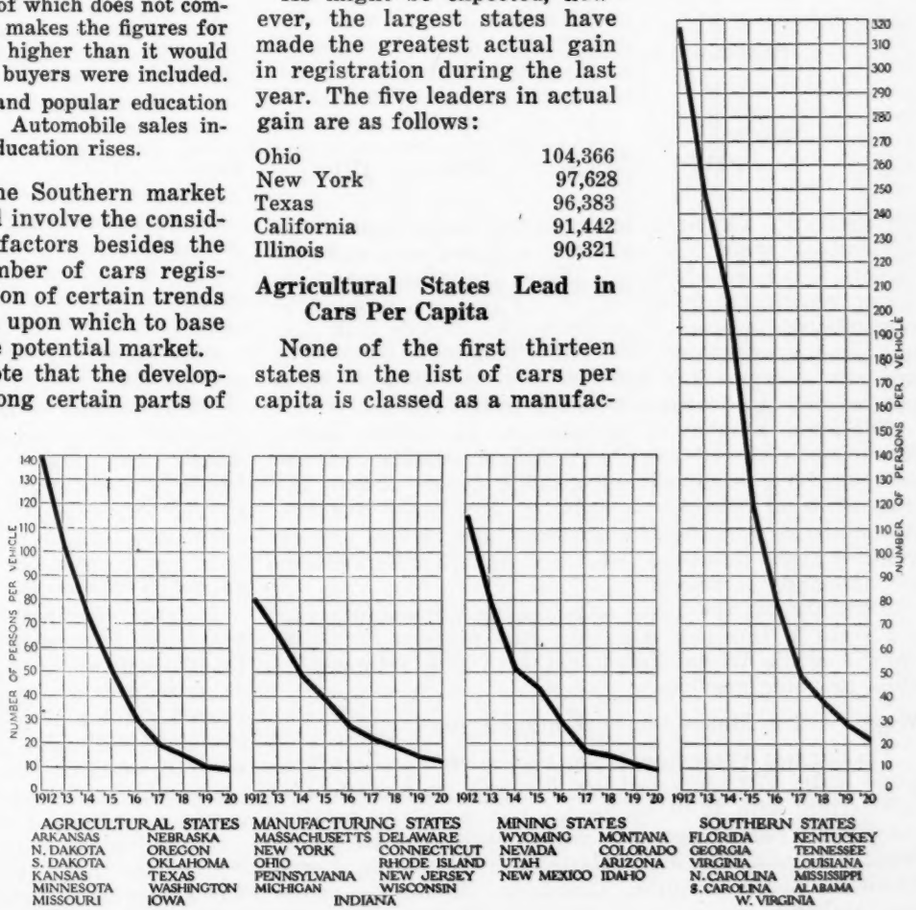
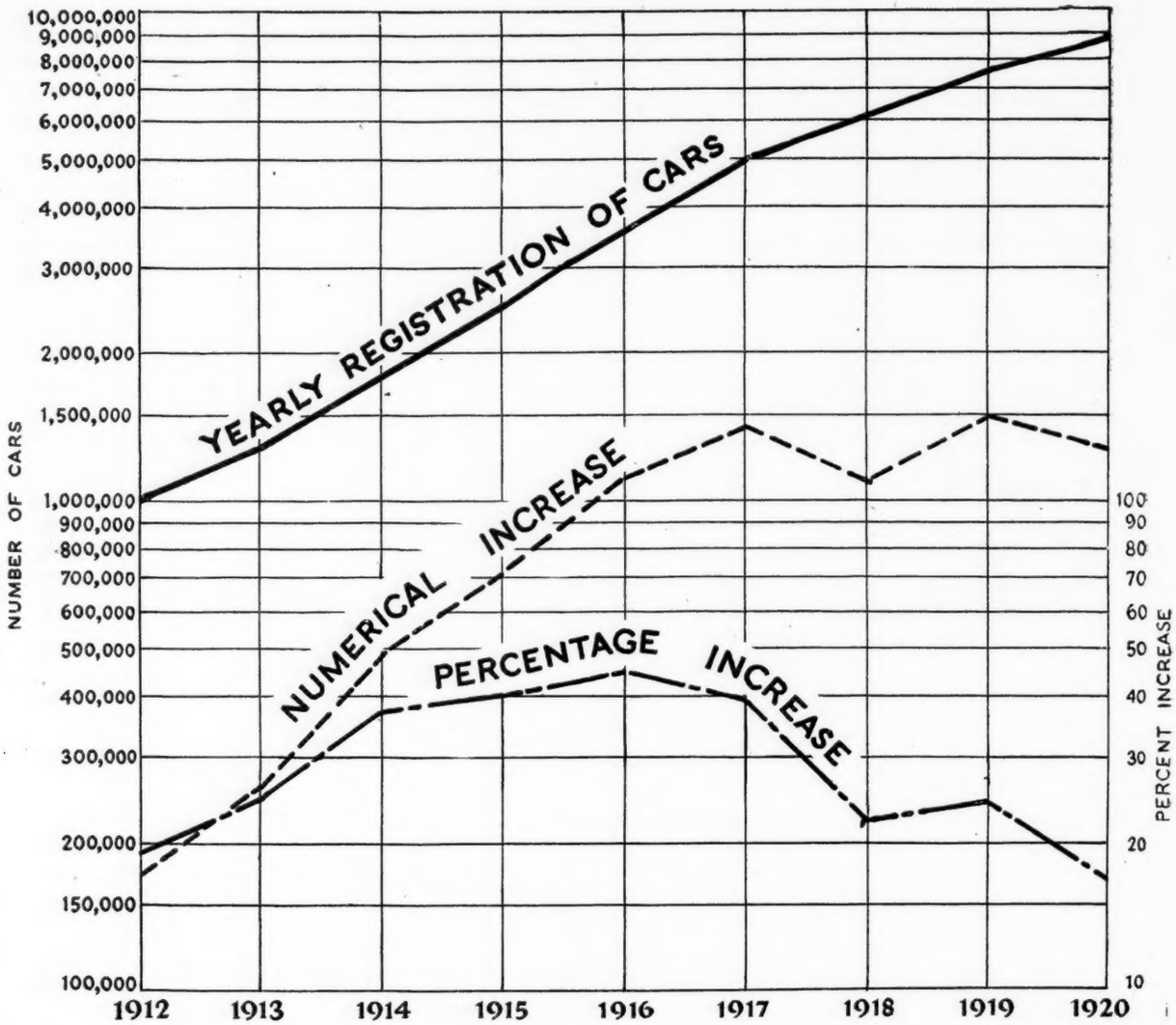


Fig. 1



turing state. The first six in the list are predominantly agricultural states. In some of the states, such as South Dakota, Iowa and Nebraska these statistics show one motor vehicle for practically every family. It must be remembered, however, that the figures include both cars and trucks and that if a more detailed and careful analysis were possible it would probably show the farm market still to be large for both cars and trucks.

The large number of persons per car in the manufacturing districts can be attributed rather to the comparatively high cost of keeping a car and to the difficulties of storing it than to any other reasons. As municipal facilities for parking, housing and storing vehicles are improved so will the city market for vehicles be materially increased.

Michigan has the honor of being the first manufacturing state in this list, with only 8.91 persons for every vehicle, while Wisconsin is next with 8.98, followed by Ohio as noted previously.

West Virginia Makes Big Percentage Gain

The largest percentage gain was made by West Virginia with 57.2, followed by Virginia with 42.6, and Mississippi with 42.12 per cent. The ten states making the largest percentage gain during 1920 in order were: West Virginia, Virginia, Mississippi, Oklahoma, North Carolina, South Carolina, Louisiana, Texas, Tennessee and Alabama.

Every one of these states may be definitely classed as a southern state. This bears out the conclusions discussed earlier in the story that merchandising in the southern states is only in the beginning of its development.

This fact that the southern states show so large a percentage of increase should be linked up with the table showing number of persons per car. In the latter table, it will be noted, the southern states are still far behind. These facts, taken together, would indicate that the South is just beginning to develop its fuller potentialities as an automotive market and that there is still a very large field there for sales before anyone need begin even thinking about the mythical saturation point so generally discussed.

A large increase in the number of automobiles together with a depressed business situation have combined to bring very close the saturation point so far as easy sales and "order-taking" merchandising is concerned. But a close analysis of the registration figures gives no indication whatever that the real saturation point is even on the horizon. When the necessary replacements are considered, together with the potential markets revealed from a study of the registration figures, it becomes evident that there is still a very large market for motor vehicles in the United States which has as yet been developed to a slight degree. Because registrations of cars and trucks have been segregated in

Cars and Trucks in the United States, December 31, 1920

New York	669,290
Ohio	615,397
Pennsylvania	570,164
California	568,892
Illinois	568,759
Iowa	437,300
Texas	427,693
Michigan	412,717
Indiana	332,707
Massachusetts	304,631
Missouri	296,919
Wisconsin	293,298
Kansas	265,396
New Jersey	227,737
Nebraska	223,000
Oklahoma	204,300
Washington	173,920
Georgia	144,422
N. Carolina	140,860
Virginia	134,000
Colorado	128,951
S. Dakota	120,395
Connecticut	119,134
Maryland	116,341
Kentucky	112,685
Oregon	103,790
Tennessee	101,852
S. Carolina	92,818
N. Dakota	90,840
West Virginia	78,862
Alabama	74,637
Florida	73,914
Louisiana	66,000
Minnesota	65,517
Mississippi	63,484
Maine	62,907
Montana	60,646
Arkansas	59,082
Idaho	50,873
Rhode Island	50,375
Utah	42,578
New Hampshire	34,680
Arizona	34,559
Vermont	31,625
Wyoming	23,926
New Mexico	22,109
Delaware	18,300
Nevada	10,464
D. of C.	9,712
Total	8,932,458

only a few states for a number of years past, the only conclusions available in regard to truck registration must be based on incomplete data. In only eight states has the separate truck registration for the last four years been completely available. On the basis of these states, bearing in mind the limitations outlined, however, some interesting deductions may be made. The states in question are New York, Pennsylvania, Michigan, New Jersey, Massachusetts, Maryland, Maine and Rhode Island.

The total truck registration of these typical states since 1917 is as follows:

1917	136,356
1918	215,637
1919	288,116
1920	306,605

It is interesting to compare the percentage of this gain with the percentage gain in total vehicle registrations for the country during that same period.

	Total registration	Car registration 8 States	Trucks in 8 States
1917 ..	39%		
1918 ..	20%	13%	36%
1919 ..	23%	26%	34%
1920 ..	17%	20%	20%

These figures would indicate that trucks experienced exceptionally good years in 1918 and 1919, but that the slump hit them a little sooner than it did the passenger cars; so far as domestic distribution is concerned at least. The more uniform increase and stability of the passenger car figures might indicate more better planned and more stabilized merchandising policy in general; a merchandising system better able to withstand sudden shocks and somewhat less dependent upon abnormal demand for steady business.

The failure to continue the percentage increase through 1920 is probably due in part to after-war conditions. It was in these manufacturing states that there was the great test of transportation which did so much to prove the emergency value of the truck. But it was also in these states that there was the greatest slump in transportation demands. Many of the trucks used in these states for war-time transportation were sent west to relieve the great congestion that appeared there. Port conditions were not so urgent after the war strain was over and at the points where transportation had been keyed up to the greatest emergency, there was the sharpest slump.

Then, too, truck registration figures are complicated by the legal definition of a truck in registration laws. In some states a truck is a vehicle on solid tires. That naturally makes an incomplete showing for trucks as the use of pneumatic tire-equipped trucks increases.

Confused Registration Figures

The confused state of the various registration systems has been mentioned before. It is necessary to explain one or two points in the present figures that they may not be misinterpreted. The registrations in Minnesota, for instance, comprise merely the cars and trucks registered during the year 1920. This does not include anything like all the cars in that state, since Dec. 31, 1920, was the end of a three-year registration period. The total for the three years would not, however, present an accurate count of the number of vehicles in the state either. The three-year figure was 324,360 and is mentioned as a matter of information.

A new law was passed in this state by the voters at the last election, which provides for a yearly registration system. The methods of working out this law, however, are now being debated by the legislature, and, since the three-year registration period previously provided for has passed, there is at the present moment no registration of motor vehicles in Minnesota.

There have been only two changes of any importance since the publication of the registration figures in AUTOMOTIVE INDUSTRIES Jan. 13. These are in the cases of Florida and Maryland, the figures for which were not available before. Maryland now appears 24th in the list of total registrations instead of 25th, as in the previous list, while Florida is actually in 32nd place instead of 38th, as placed in the previous compilation.

Slight revisions appear in the case of about 10 other states, none of the changes being important enough to change the states' positions in the list of total registrations.

Some states register tractors with trucks and do not register trailers; others register trailers with trucks and do not register tractors; others register both tractors and trailers with trucks; and still others register neither trailers nor tractors in any way. These facts should be borne in mind when any calculations are being made on the basis of apparently segregated registrations.

It is the practice in some States, as well, to classify vehicles on the basis of use rather than construction.

Gain in Registration 1919—1920

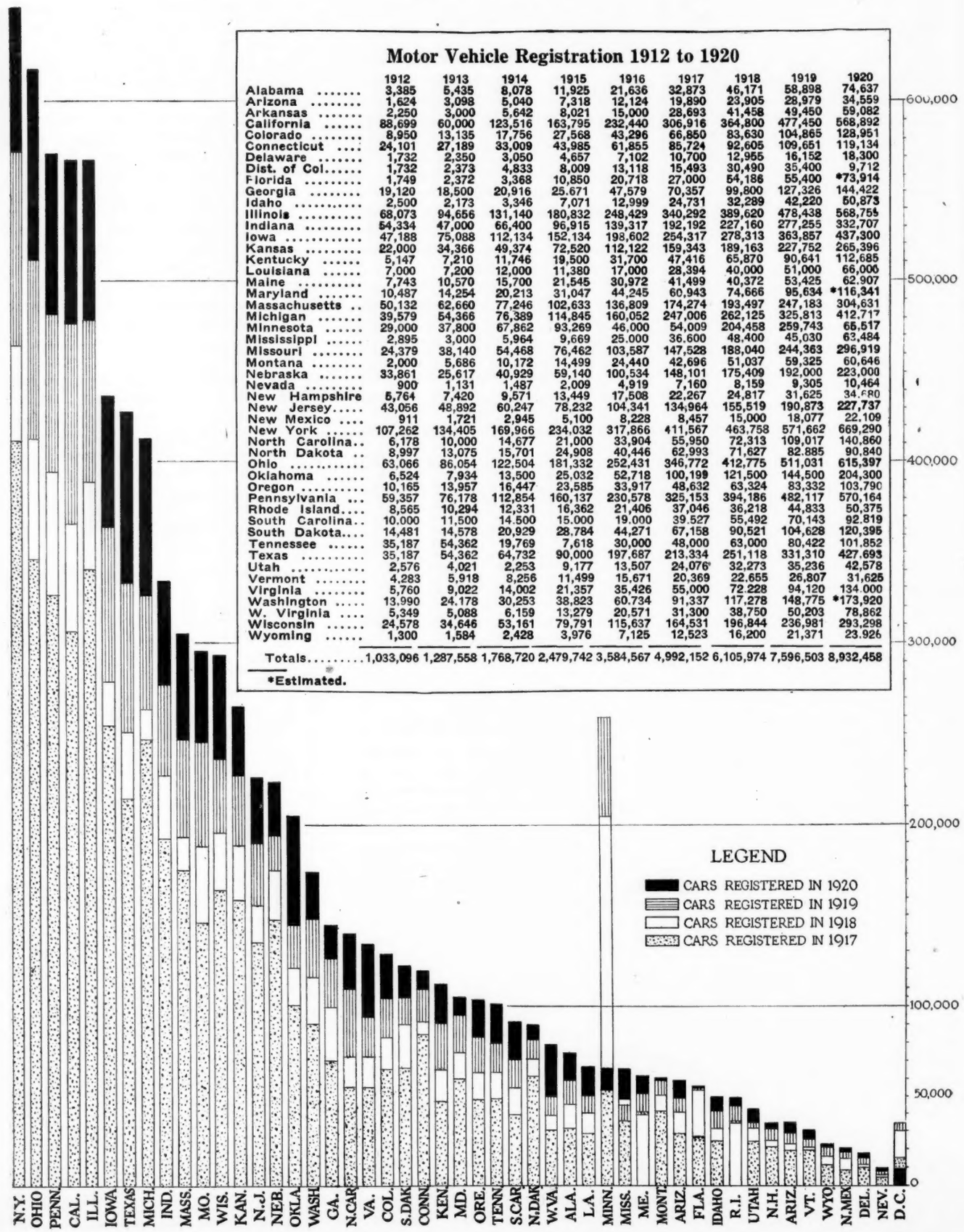
Ohio	104,366
New York	97,628
Texas	96,373
California	91,442
Illinois	90,321
Pennsylvania	88,047
Michigan	86,904
Iowa	73,443
Oklahoma	59,800
Massachusetts	57,448
Wisconsin	56,317
Indiana	55,452
Missouri	52,556
Virginia	39,880
Kansas	37,644
New Jersey	36,864
N. Carolina	31,843
Nebraska	31,000
W. Virginia	28,659
Washington	25,145
Colorado	24,086
S. Carolina	22,675
Kentucky	22,044
Tennessee	21,430
Maryland	20,707
Oregon	20,458
Mississippi	18,454
Florida	18,514
Georgia	17,096
S. Dakota	15,767
Alabama	15,739
Louisiana	15,000
Arkansas	9,632
Connecticut	9,483
Maine	9,482
Idaho	8,653
N. Dakota	7,955
Utah	7,342
Arizona	5,580
Rhode Island	5,542
Vermont	4,818
New Mexico	4,032
New Hampshire	3,055
Wyoming	2,555
Delaware	2,148
Montana	1,321
Nevada	1,159
Dist of Columbia	—25,683
Minnesota	—194,226
Total	1,335,955

Increase or Decrease in Car and Truck Registrations 1912—1920

Motor Vehicle Registration 1912 to 1920

	1912	1913	1914	1915	1916	1917	1918	1919	1920
Alabama	3,385	5,435	8,078	11,925	21,636	32,873	46,171	58,898	74,637
Arizona	1,624	3,098	5,040	7,318	12,124	19,890	23,905	28,979	34,559
Arkansas	2,250	3,000	5,642	8,021	15,000	28,693	41,458	49,450	59,082
California	88,699	60,000	123,516	163,795	232,440	306,916	364,800	477,450	568,892
Colorado	8,950	13,135	17,756	27,568	43,296	66,850	83,630	104,865	128,951
Connecticut	24,101	27,189	33,009	43,985	61,855	85,724	92,605	109,651	119,134
Delaware	1,732	2,350	3,050	4,657	7,102	10,700	12,955	16,152	18,300
Dist. of Col.	1,732	2,373	4,833	8,009	13,118	15,493	30,490	35,400	9,712
Florida	1,749	2,372	3,368	10,850	20,718	27,000	54,186	55,400	*73,914
Georgia	19,120	18,500	20,916	25.671	47,579	70,357	99,800	127,326	144,422
Idaho	2,500	2,173	3,346	7,071	12,999	24,731	32,289	42,220	50,873
Illinois	68,073	94,656	131,140	180,832	248,429	340,292	389,620	478,438	568,755
Indiana	54,334	47,000	66,400	96,915	139,317	192,192	227,160	277,255	332,707
Iowa	47,188	75,088	112,134	152,134	198,602	254,317	278,313	363,857	437,300
Kansas	22,000	34,366	49,374	72,520	112,122	159,343	189,163	227,752	265,396
Kentucky	5,147	7,210	11,746	19,500	31,700	47,416	65,870	90,641	112,685
Louisiana	7,000	7,200	12,000	11,380	17,000	28,394	40,000	51,000	66,000
Maine	7,743	10,570	15,700	21,545	30,972	41,499	40,372	53,425	62.907
Maryland	10,487	14,254	20,213	31,047	44,245	60,943	74,666	95,634	*116,341
Massachusetts	50,132	62,660	77,246	102,633	136,809	174,274	193,497	247,183	304,631
Michigan	39,579	54,366	76,389	114,845	160,052	247,006	262,125	325,813	412,717
Minnesota	29,000	37,800	67,862	93,269	46,000	54,009	204,458	259,743	65.517
Mississippi	2,895	3,000	5,964	9,669	25.000	36.600	48,400	45,030	63,484
Missouri	24,379	38,140	54,468	76,462	103,587	147,528	188,040	244,363	296,919
Montana	2,000	5,686	10,172	14,499	24,440	42,696	51,037	59,325	60,646
Nebraska	33,861	25,617	40,929	59,140	100,534	148,101	175,409	192,000	223,000
Nevada	900	1,131	1,487	2,009	4,919	7,160	8,159	9,305	10,464
New Hampshire	5,764	7,420	9,571	13,449	17,508	22,267	24,817	31,625	34,680
New Jersey	43,056	48,892	60,247	78,232	104,341	134,964	155,519	190,873	227,737
New Mexico	911	1,721	2,945	5,100	8,228	8,457	15,000	18,077	22.109
New York	107,262	134,405	169,966	234,032	317,866	411,567	463,758	571,662	669,290
North Carolina	6,178	10,000	14,677	21,000	33,904	55,950	72,313	109,017	140.860
North Dakota	8,997	13,075	15,701	24,908	40,446	62,993	71,627	82.885	90.840
Ohio	63.066	86.054	122,504	181,332	252,431	346,772	412,775	511,031	615,397
Oklahoma	6,524	7,934	13,500	25,032	52,718	100,199	121,500	144,500	204,300
Oregon	10,165	13,957	16,447	23,585	33,917	48,632	63,324	83,332	103,790
Pennsylvania	59,357	76,178	112,854	160,137	230,578	325,153	394,186	482,117	570,164
Rhode Island	8,565	10,294	12,331	16,362	21,406	37,046	36,218	44,833	50,375
South Carolina	10.000	11,500	14.500	15.000	19.000	39.527	55,492	70,143	92.819
South Dakota	14,481	14,578	20,929	28.784	44,271	67,158	90,521	104,628	120,395
Tennessee	35,187	54,362	19,769	7,618	30,000	48,000	63,000	80,422	101.852
Texas	35,187	54,362	64,732	90,000	197,687	213,334	251,118	331,310	427.693
Utah	2,576	4,021	2,253	9,177	13,507	24,076	32,273	35,236	42,578
Vermont	4,283	5,918	8,256	11,499	15,671	20,369	22,655	26,807	31,625
Virginia	5,760	9,022	14,002	21,357	35,426	55,000	72.228	94,120	134.000
Washington	13.990	24.178	30,253	38,823	60.734	91,337	117,278	148,775	*173,920
W. Virginia	5,349	5,088	6,159	13,279	20,571	31,300	38,750	50,203	78,862
Wisconsin	24,578	34,646	53,161	79,791	115,637	164,531	196,844	236,981	293,298
Wyoming	1,300	1,584	2,428	3,976	7,125	12,523	16,200	21,371	23.926
Totals	1,033,096	1,287,558	1,768,720	2,479,742	3,584,567	4,992,152	6,105,974	7,596,503	8,932,458

*Estimated.



Percentage Increase in Registration
Dec. 31, 1919 to Dec. 31, 1920

West Virginia	57.20
Virginia	42.60
Mississippi	42.12
Oklahoma	41.40
Florida	33.46
N. Carolina	32.92
S. Carolina	32.19
Louisiana	29.42
Texas	29.09
Tennessee	27.18
Alabama	26.79
Michigan	26.67
Oregon	25.19
Kentucky	24.22
Wisconsin	23.76
Massachusetts	23.24
Colorado	23.00
New Mexico	22.30
Missouri	21.45
Maryland	21.00
Utah	20.79
Ohio	20.39
Indiana	20.32
Iowa	20.23
New Jersey	19.62
Arkansas	19.45
Arizona	19.30
California	19.11
Idaho	19.01
Illinois	18.89
Pennsylvania	18.28
Vermont	17.93
Maine	17.70
New York	17.00
Washington	16.80
Kansas	16.52
Nebraska	16.14
S. Dakota	15.07
Georgia	13.40
Delaware	13.31
Rhode Island	12.35
Wyoming	11.98
Nevada	11.58
N. Dakota	9.69
New Hampshire	9.66
Connecticut	8.65
Montana	2.22
Dist. of Columbia	—72.56
Minnesota	—75.50
Average Increase	15.65

The Agricultural Market

It is reasonable to suppose that the value of the state crop would have some general relation to the automobile population in the state. Where the value of the crop per person is large, there is an indication of potential buying power and the number of automobiles should be proportionately large. Where this is not the case, there would seem to be an excellent market, undeveloped up to the present time for one reason or another.

The values of the crops in the agricultural states during 1920 according to *Agricultural Statistics* were as follows:

Texas	$788,983,000
Iowa	783,488,000
Nebraska	522,186,000
Kansas	399,844,000
South Dakota	366,582,000
Arkansas	359,538,000
Oklahoma	329,579,000
North Dakota	220,290,000
Washington	144,422,000
Oregon	108,632,000

This list includes the chief states which are predominantly agricultural, but not necessarily those which produce the greatest crop values. They are, however, what may be classed as our chief agricultural states. Bearing in mind that these states have the fewest persons per car, it is interesting to compare the population per car with the per capita value of the crops. As noted previously, these two lists should logically correspond in a general way. Here is the way it actually works out:

State	Persons Per Car
1. South Dakota	5.24
2. Iowa	5.50
3. Nebraska	5.82
4. Kansas	6.64
5. North Dakota	7.11
6. Oregon	7.57
7. Washington	7.82
8. Oklahoma	9.91
9. Texas	10.91
10. Arkansas	29.70

	Per Capita Crop Value
1. South Dakota	$547
2. Nebraska	406
3. North Dakota	340
4. Iowa	324
5. Oregon	238
6. Kansas	224
7. Arkansas	204
8. Texas	190
9. Oklahoma	164
10. Washington	101

An examination of this table shows that the per capita crop valuation is a fairly accurate estimate of the automobile sales in these ten agricultural states. While there is, of course, some variation, it is slight except in one case. South Dakota heads the list both in cars per capita and in per capita crop value.

Iowa, though fourth in per capita crop value is second in cars per capita. This indicates that Iowa has been very thoroughly sold on automobiles and trucks, as does the numbers of persons per car figure itself. There is, however, $81 difference in the per capita crop value between Iowa and Nebraska yet Iowa has slightly more cars per capita. On this basis it would seem that Nebraska still offers a fertile field for automotive sales and that sales resistance in that state has not yet grown so strong as in Iowa.

Texas leads Oklahoma by $26 in the per capita crop value list, yet is behind Oklahoma in the persons per car classification. As before, this seems to indicate that Texas offers an excellent field for future sales, especially when these figures are considered in connection with those in a later article showing the amounts available for road building in the various states. Texas has a larger amount available for expenditure in 1921 than any other state, $60,000,000 being the sum set for building new roads in Texas during 1921.

The major exception, previously mentioned, is found in Arkansas. This state with a per capita crop value of $204 stands seventh in that list being only $20 behind Kansas which has but 6.64 persons per car, and Arkansas is $15 above Texas in this list, while Texas shows only 10.91 persons per car. Yet Arkansas stands far down at the bottom of the agricultural states in the list of persons per car, with only one car for every 29.7 persons in the state.

These figures would seem a rather large undeveloped market for cars and trucks in Arkansas; a market which has not been touched to any great extent as yet for one reason or another. Whether or not this is actually the case, the suspicion is rendered very strong by the fact that the relation between registrations and per capita crop value bears a fairly accurate proportion in each of the other agricultural states.

Motorcycles Gain Slightly

Motorcycles have been holding their own in the United States since the end of the war. After showing a very small decrease in 1919, the total registrations for 1920 went ahead of the two previous years. The total registrations in 1920 were 234,954, an actual increase of 1568 and a percentage gain of .68 per cent over 1919.

These figures do not indicate that

NUMBER OF PERSONS PER CAR, Dec. 31, 1920

State	Pop.	Cars and Trucks	Pop. per Car
So. Dakota	635,839	120,395	5.24
Iowa	2,403,630	437,300	5.50
Nebraska	1,295,502	223,000	5.82
California	3,426,536	568,892	6.02
Kansas	1,769,257	265,396	6.64
N. Dakota	645,730	90,840	7.11
Colorado	939,376	128,951	7.29
Nevada	77,407	10,464	7.39
Oregon	783,389	103,790	7.57
Washington	1,356,316	173,920	7.82
Wyoming	194,402	23,926	8.12
Idaho	431,826	50,873	8.48
Indiana	2,930,544	332,707	8.82
Michigan	3,667,222	412,717	8.90
Wisconsin	2,631,839	293,298	8.98
Montana	547,593	60,646	9.02
Ohio	5,759,368	615,397	9.36
Arizona	333,273	34,559	9.67
Oklahoma	2,027,564	204,300	9.91
Utah	449,446	42,578	10.56
Texas	4,661,027	427,693	10.91
Vermont	352,421	31,625	11.13
Illinois	6,485,098	568,759	11.41
Missouri	3,403,547	296,919	11.50
Connecticut	1,380,585	119,134	11.59
Rhode Island	604,397	50,375	11.99
Delaware	223,003	18,300	12.19
Maine	768,014	62,907	12.21
Maryland	1,449,610	116,341	12.46
Mass.	3,852,356	304,631	12.67
N. Hamp.	443,083	34,680	12.76
Florida	966,296	73,614	13.10
New Jersey	3,155,374	227,737	13.95
Penn.	8,720,159	570,164	15.29
New York	10,384,144	669,290	15.52
N. Mexico	360,247	22,109	16.30
Virginia	2,306,361	134,000	17.20
S. Carolina	1,683,662	92,818	18.13
N. Carolina	2,556,486	140,860	18.15
W. Virginia	1,463,610	78,862	18.54
Georgia	2,894,683	144,422	20.05
Kentucky	2,416,013	112,685	21.46
Tennessee	2,337,459	101,852	23.35
Mississippi	1,789,384	63,484	27.99
Louisiana	1,797,798	66,000	27.24
Arkansas	1,750,995	59,082	29.70
Alabama	2,347,295	74,637	31.49
Minnesota	2,386,271	65,517	36.45
Dist. of Col.	437,571	9,712	45.00
Totals	105,683,108	8,932,458	11.84

MOTORCYCLE REGISTRATIONS
1918-1920

	1918	1919	1920
Alabama	1,180	1,103	1,035
Arizona	685	596	542
Arkansas	**	**	**
California	27,887	28,028	20,047
Colorado	3,909	3,636	3,364
Connecticut	4,246	4,495	6,543
Delaware	707	699	674
Dist of Col.	2,353	2,412	519
Florida	1,629	1,412	1,275
Georgia	1,681	1,722	1,688
Idaho	707	731	764
Illinois	10,834	10,920	10,597
Indiana	9,112	8,995	8,823
Iowa	2,529	3,035	4,000*
Kansas	4,173	3,589	2,972
Kentucky	1,479	1,503	1,543
Louisiana	399	490*	500
Maine	1,497	1,608	1,566
Maryland	5,351	5,872	7,332
Massachusetts	12,862	13,698	15,143
Michigan	7,818	7,875	8,011
Minnesota	5,021	6,389	1,158
Mississippi	100*	120*	194
Missouri	3,980	4,131	3,954
Montana	852	847	675
Nebraska	2,900	2,500	2,000
Nevada	121	125	141
New Hampshire	2,452	2,632	2,542
New Jersey	12,517	11,416	11,041
New Mexico	300	200	219
New York	28,597	28,561	29,453
North Carolina	1,333*	1,459	1,418
North Dakota	1,659	901	898
Ohio	20,717	20,444	26,956
Oklahoma	1.622	1,310	1,320
Oregon	3,501	3,570	3,516
Pennsylvania	26,621	25.760	23,981
Rhode Island	1.464	2,301	2,225
South Carolina	1,147	869	908
South Dakota	1,323	888	777
Tennessee	800	1,133	1,151
Texas	2,496	3,889	4,293
Utah	1,298	1,185	1,114
Vermont	734	800	946
Virginia	2.414	2,520	2,233
Washington	6,317	5,050	4,915
West Virginia	847	994	1,659
Wisconsin	7,238	7,223	8,002
Wyoming	313	353	327
TOTAL	233,665	233,386	234,954

*Estimated **Not segregated

the motorcycle industry is standing still as might be supposed from a superficial survey. A number of factors, such as the enormous government and foreign trade work done during the war, enter into any detailed examination of the registration statistics as an indication of the present status of the industry. A consideration of these factors shows the industry to be in a healthy condition and to be progressing at a normal rate and puts a different aspect upon the actual registration figures.

There is not space in this article to analyze thoroughly the present status of the American motorcycle industry, but an article in a later issue will summarize all phases of the present situation and point out probable trends in the immediate future, based upon a careful survey of the industry as a whole.

The states which have the largest number of automobiles have also the largest number of motorcycles. This would indicate that motorcycles fill a distinct field of their own and are not competitors of the automobiles; that the motorcycle is the compliment of the automobile and that it thrives in the same places as the car and has hard going where cars are not numerous.

The ten states having the largest number of motorcycles, for instance, are as follows:

New York	29,453
Ohio	26,956
Pennsylvania	23,981
California	20,047
Massachusetts	15,143
New Jersey	11,041
Illinois	10,597
Indiana	8,823
Michigan	8,011
Wisconsin	8,002

The first four states in the motorcycle list correspond with those of the similar automobile table, while all of these first ten in the motorcycle list appear among the first fourteen in the automobile tabulation.

Tractor Registrations

While the registration of tractors and trailers is not yet general enough to form a sound basis for finding the number in use in the country, it is interesting to examine the figures available with a view to understanding the present status of the question in general. Consequently, the accompanying table is of value in showing the states in which it is possible to determine the number of tractors and trailers with any degree of accuracy and those in which figures of any kind are not available.

About ten states now register tractors separately, and one more will begin to register them in 1921. In most cases, however, the number of registrations is not a guide to the number of tractors, since the majority of these ten states register only commercial tractors or tractors which use the roads. Consequently, estimates made by reliable sources form a truer basis for determining the actual number of tractors even in the states which register them. Such reliable estimates have been used in this table wherever available.

It would be advantageous to the industry if tractors could be universally registered, but that does not mean that they should be licensed and taxed. There is one state already, for instance, that registers all tractors but does not license them. The accompanying table, however, is printed as a matter of interest and as being the best data available on this subject at the present time.

Estimated Number of Tractors

With no figures at all available from twenty-three states, and with the figures from many other states obviously inaccurate, there is no sound basis upon which to estimate the number of tractors actually in use in this country. Assuming the life of a tractor to be seven years with good care, the number at present in use would be something like 433,000, the estimate being based upon production figures. Again, however, accurate production figures are difficult to obtain, and at the present time few tractors get "good care," so that 433,000 is probably a high estimate.

There are five big tractor states for which no figures are given in the acompanying table. The total of the states shown in the table is 153,458. Estimating very roughly from the meager facts available, a good guess as to the number of tractors now in use would be something like 300,000 to 350,000.

A tractor expert estimated about a year ago that there is an immediate market for about 695,000 tractors in the country.

The table shows a total of 17,677 trailers registered in 12 states. Figuring on a population basis, these 12 states comprise about 40 per cent of the entire country. Thus, using population as a basis, it may be estimated roughly that there are 45,000 trailers now in use in the United States.

TRACTORS AND TRAILERS IN U. S., 1920

	Tractors	Trailers
Alabama	....	....
Arizona	1,500†	....
Arkansas	1,350†	....
California	20,000†	....
Colorado	4,000§	2,532
Connecticut	....	....
Delaware	....	61
District of Columbia	....	....
Florida	....	....
Georgia	....	....
Idaho	....	....
Illinois	215*	....
Indiana	10,379†	....
Iowa	17,683†	537
Kansas	16,379	....
Kentucky	....	....
Louisiana	8,000§	....
Maine	550†	....
Maryland	183*	262
Massachusetts	1,800†	495
Michigan	20,350‡	3,711
Minnesota	....	....
Mississippi	2,000†	....
Missouri	....	....
Montana	....	....
Nebraska	....	....
Nevada	300†	....
New Hampshire	200†	....
New Jersey	400†	792
New Mexico	....	....
New York	7.500§	2,862
North Carolina	2,500†	....
North Dakota	....	....
Ohio	8,313‡	4,500
Oklahoma	2,835†	....
Oregon	....	....
Pennsylvania	6,823†	876
Rhode Island	100†	19
South Carolina	....	....
South Dakota	6,808†	....
Tennessee	....	....
Texas	....	....
Utah	....	....
Vermont	....	....
Virginia	3,500†	....
Washington	....	1,030
West Virginia	....	....
Wisconsin	9,790	....
Wyoming	....	....
Totals	153,458	17,677

*Registration figures.
‡State Bureau of Agriculture estimate.
‡State Agricultural College estimate.
§Other estimates.

Design Tendencies in 1921 American Passenger Car Chassis

Decrease in percentage of eight and twelve cylinder models with gain in four and six type indicates tendency toward simplification, as does also the gain in percentage of unit power plants. Marked increase in pressure and splash-pressure lubrication. Less pronounced gain in I and L-head cylinders. Transmission emergency brake used on several cars.

By Herbert Chase

ANALYSIS of the specifications of American passenger car chassis for 1921 reveals no very pronounced deviation from 1920 practice. This is no doubt due in large part to the fact that the industry was too busy on production of cars early in 1920 to consider many changes in the 1921 product even if the engineering department had concluded that such changes would be desirable. It is known, however, that the engineering staff of practically all plants has been unusually busy during the past few months when production has been extremely light, so that there are apt to be more changes in the 1922 product than in the 1921, but even these do not promise to be of a radical nature, for the industry has long since reached a point where its product is so nearly standardized that pronounced changes are taboo unless their need is imperative.

Too Little Attention to Fuel Saving

Not a few engineers usually regarded as conservative consider that some radical departure in engine type will soon be forced by the exigencies of the fuel situation, but the current models of passenger cars, taken as a whole, do not indicate that the relatively inefficient use of fuel so long in evidence has been appreciated or at least considered of sufficient importance to warrant the attention it should have received. More cars are being fitted with means for exhaust heating of the inlet manifold, but even this first step toward obtaining better efficiency has not been taken by many, and by many others is applied in a very crude manner. With but few exceptions other refinements calculated to increase fuel economy are lacking, though they are fortunately receiving serious consideration by some of the more progressive manufacturers.

Tendencies Toward Simplification

A commendable tendency away from an unnecessary multiplication of cylinders which many predicted when a few concerns considered designs of this character warranted, is continuing. Less than 1 per cent* of all chassis listed now have twelve-cylinder engines, as against 4 per cent in 1917 and 2.75 per cent last year. There is also a falling off in percentage of cars fitted with eight-cylinder engines—8.5 per cent, as against 12.6 per cent in 1916 and 9.17 per cent last year. While there is a slight increase in sixes—56.8 per cent in 1920 as against 57.7 per cent this year—there is a greater increase in fours—from 30.3 to 33 per cent.

Another tendency toward simplicity is the increasing use of the unit powerplant in place of separate engine and gearset. Eighty-eight per cent of all models use this construction as against 79.5 per cent last year. One advantage thus gained is the elimination of extra shaft and universals between engine and gearbox, but this advantage has been offset in some cases by the lack of accessibility, particularly of the clutch. In some new and, in most respects, well designed chassis it is necessary to disconnect the rear axle and the transmission in order to remove the clutch. Reasonable accessibility can and should be provided without sacrificing the benefits of the unit construction. Improvements in this respect should certainly be sought after and applied, for the service problem is much too serious to be aggravated by failure to afford accessibility wherever it can be secured. To appreciation of this fact is partly due the decision of certain manufacturers to use engines with fewer cylinders and consequently less complication.

Another slight tendency toward simplification is indicated by the fact that the per cent of models using thermosiphon cooling has increased in the past year from 29.3 to 31.8. While the advantages of this construction are no doubt worth while, it should not be forgotten that they are attained at the expense of some increase in weight, for the pump circulation makes possible the use of a smaller radiator and a cooling system containing less water.

The Light Car Notably Absent

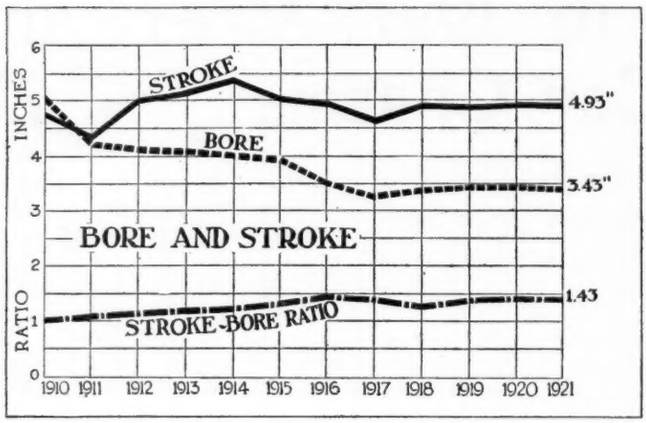
The average wheelbase of all models is 120.77 in., this figure having varied less than 1/10 in. since 1918. Average horsepower is also about the same as last year, indicating that taxation and the cost of upkeep and fuel are not considered of sufficient moment for American manufacturers to follow the example set by British and Continental manufacturers in the production of a considerable number of cars weighing less than 1500 lb. with body, and having engines of 100 cu. in. displacement or less, many of them air cooled. While some of these cars have a tread of less than 56 in. others have standard tread. They carry two and some four passengers and in nearly all respects are of conventional construction, hence are not to be classed as cycle cars. There would seem to be possibilities in a car of this character in this country.

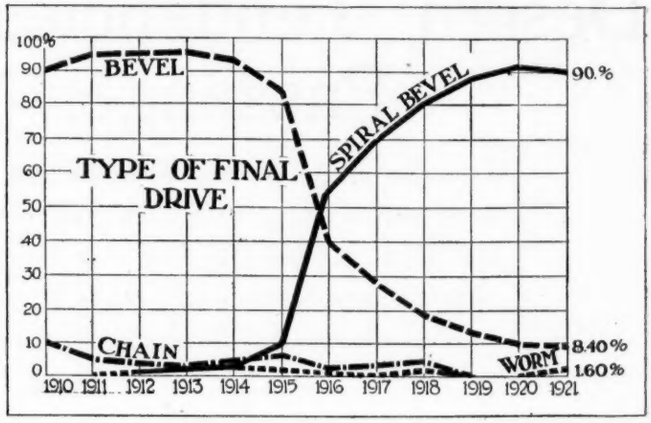
The use of L-head and valve-in-head engines continues to increase at the expense of the T-head, F-head and Knight types. Only 4 per cent of all models use T-head construction, as compared to 7.47 per cent last year. The so-called "F"-head, in which one valve is in the head and one in an L at the side of the cylinder, also shows a decrease from 5.68 to 3.1 per cent.

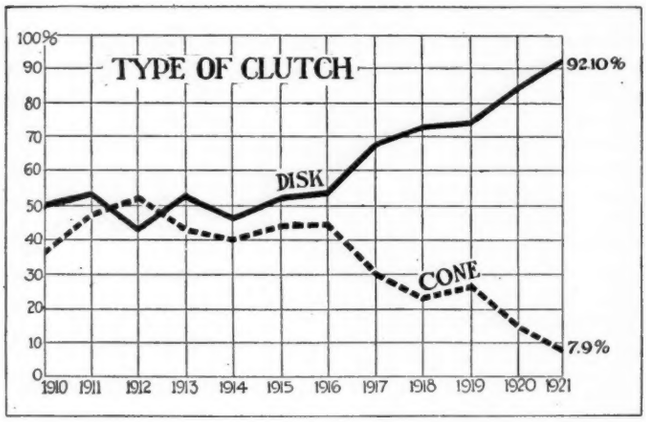
There is practically no change in the type of drive employed for the camshaft. The use of helical or spiral gears shows a slight increase from 75.2 to 77.7 per cent, whereas the use of the silent chain has increased from 18.3 to 19

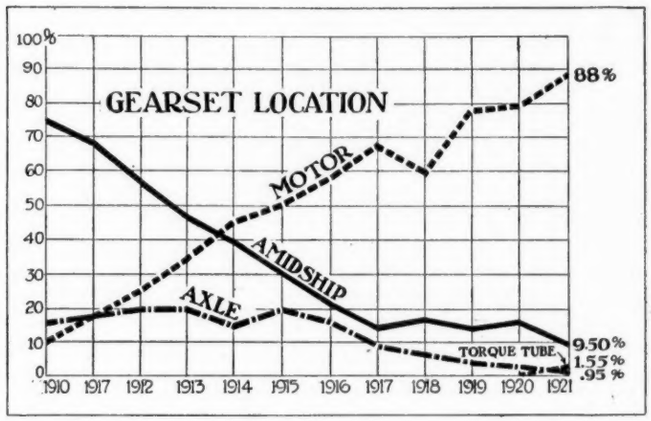
*Percentage figures in this article refer to the per cent of models listed in the accompanying table, concerning which information has been supplied under the heading in question. The figures do not take into consideration the number of each or any model which the various manufacturers produce.

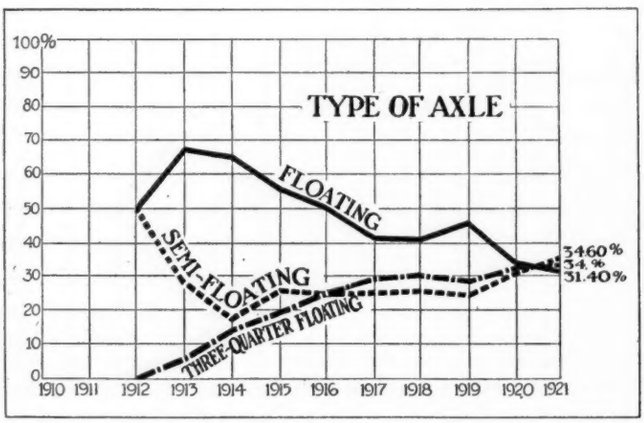
Tendencies in Passenger Car Design 1910 to 1921

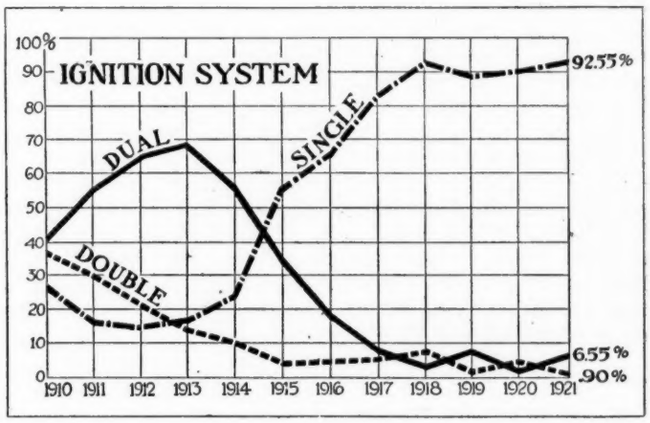


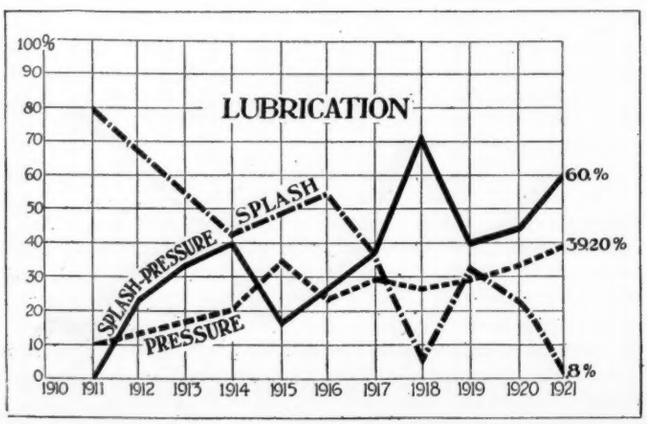


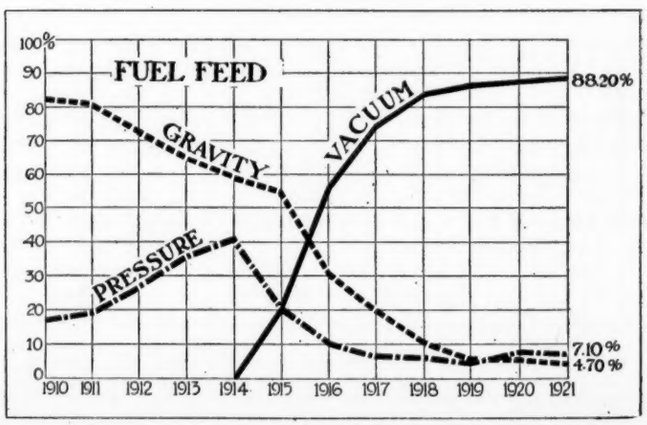




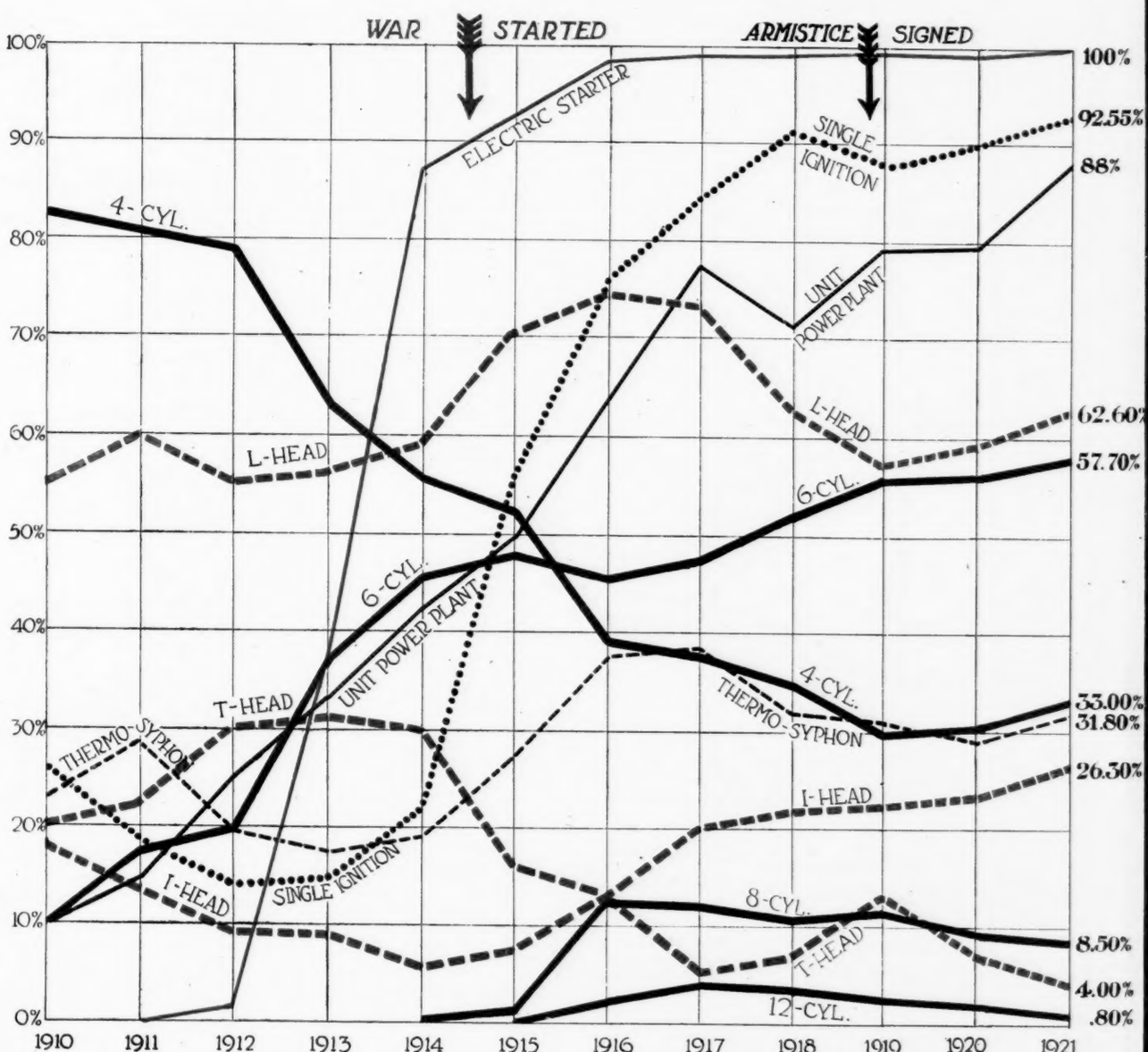




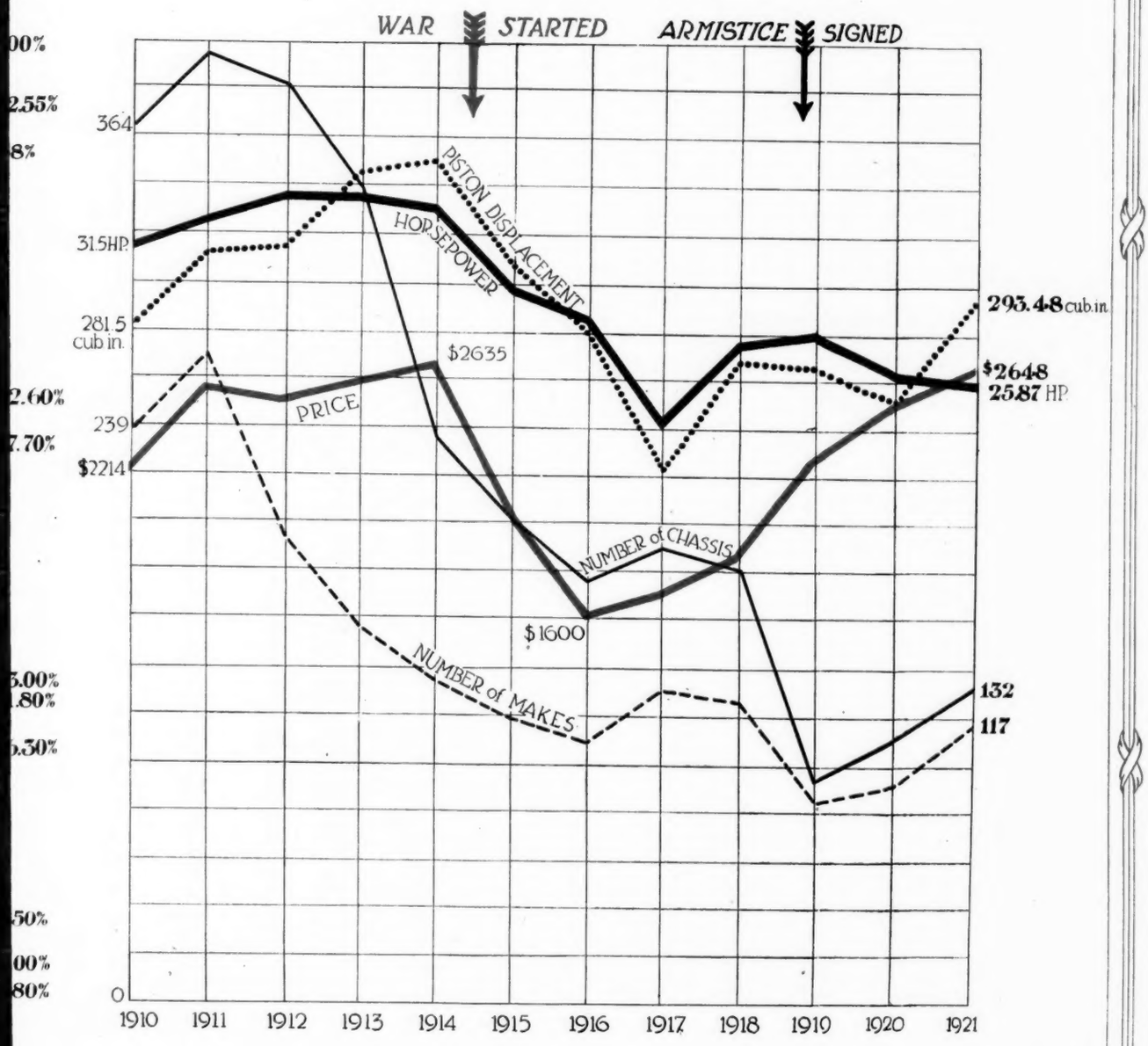




Trends of the American Passenger Car Chas
Most Important Factors in



hassis for 12 Years, Showing Variations of in Design and Manufacture



per cent; practically all other drives are straight spur gears, this type being used on 2.5 per cent of models this year as against 5.5 per cent last year.

Electrical Equipment

In the matter of electrical equipment the change is slight, but accessibility has been improved in some instances, for example by placing the distributor on top of the engine. There is still much room for improvement in the matter of battery location. The lesson of properly supporting this troublesome unit has been fairly well learned, but the question of accessibility is too often overlooked. The battery is often regarded as a necessary evil, and there can be no denying the fact that its life is all too short. For this reason if for no other it should be placed where it can be easily inspected and filled, for its life will depend partly upon the care given it, and it is more apt to be neglected if hard to get at.

Last year less than 1 per cent of models listed were without electric starting. This year even the small minority have seen the light and no American car is without this useful accessory. A few makes are using belt drive for the lighting generator, a practice quite general in the case of British cars. The belt drive is quiet and can be made easily adjustable, but the fact that it occasionally requires adjustment while most other forms of drive do not, except perhaps at rare intervals, is certainly not a point in favor of the belt driven type.

Single ignition shows a small gain in popularity, and is used on 92.5 per cent of models. While the advocates of dual ignition have more than doubled they comprise only 6.55 per cent of the total, as compared with nearly 70 per cent in 1913. The gain in battery ignition is of course due only in part to the merits of the system considered alone, but it is evident that its reliability has greatly increased, else the users of dual ignition would not now include so small a percentage of the total. Nevertheless it is not uncommon to hear a driver whose battery is in poor shape say that he wished the car had magneto ignition, so that this important factor would not be dependent upon what is perhaps the most unreliable element in the modern car.

Lubrication

In respect to lubrication perhaps the most important factor is the greater attention being paid to lubrication of chassis parts. Some think and many hope that the days of the grease cup are numbered. However this may be, the use of more positive means of chassis lubrication is increasing. The use of grease has been rendered much more satisfactory by providing a more positive and more easily operated means of forcing the grease to the desired point. Some still lack confidence in grease lubricating systems, however well applied, and look to the provision of means for feeding oil to the wearing parts as the most promising method of accomplishing the desired result. Oil cups with means for gradual feed are being placed on the market and at least one system of forcing oil from a central reservoir to all chassis points needing oil is being used.

In the matter of engine lubrication the statistics show a considerable increase in the percentage of cars using the splash-pressure system; 43.5 per cent of models used this system in 1920 while 60 per cent use it this year. The pressure system in which oil is forced to both main and crank-pin bearings also shows an increase from 33.3 to 39.2 per cent. Less than 1 per cent of the models now listed depend entirely upon splash lubrication.

The percentage of cars using vacuum feed has slightly increased, the statistics showing that 87 per cent of models used this system in 1920, while 88.2 per cent use it in 1921. There is a slight decrease in the use of both the pressure and gravity feed systems.

Turning now to the transmission system, we find that the use of the disk and the plate type of clutch is increasing at the expense of the cone type. No less than 92.1 per cent of American cars are now fitted with multiple disk or plate type as compared with 84.9 per cent last year. The cone type, which in Europe is much more popular than in this country, is rapidly disappearing here; 15.1 per cent of 1920 models used the cone type, but only 7.9 per cent of 1921 models employ this type of clutch. The reason for this preference is no doubt due to the fact that the disk and plate types require less attention than the cone type when they are well constructed. The use of pressed or moulded facings instead of woven fabric is becoming more general, due in part to the fact that this type of facing has a higher coefficient of friction and is said to be more durable than woven fabric.

Only slight changes are noticeable in gearsets. The vast majority of these have three speeds and many of them are fitted with air pumps for use in tire inflation. Manufacturers of stock transmission are quite generally providing means for mounting the air compressor, a standard S. A. E. base being employed.

A large number of cars now use hollow propeller shafts fitted at one or both ends with fabric disk universals, but the use of one or more all metal universal joints still predominates.

As between axle types there is apparently but little choice, although the semi-floating type is used on 34.6 per cent of models, while 34 per cent use the three-quarter type and 31.4 per cent use the full floating axle. Only very slight changes have taken place in this respect in the last year.

Final Drives

The use of the spiral bevel final drive has slightly decreased, but it is still employed by 90 per cent of all models as compared to 90.6 per cent last year. The straight bevel shows a slight decrease also, from 9.4 to 8.4 per cent, while the worm gear, which had no advocates last year, is now employed on 1.6 per cent of the models listed.

Quite a number of cars are using transmission emergency brakes, the foot brake applying only on rear wheels in these cases. The great majority of cars, however, still have both brakes on the rear wheels, but the percentage of the latter which use the contracting band is decreasing. The use of the contracting band is very rare in Europe and is losing ground in this country partly because it is more difficult to prevent dragging and partly because it catches a great deal of dirt and is sometimes torn loose by broken skid chains. The internal type is better protected but unfortunately is not so easily adjusted and relined as the external type.

The use of the wooden wheels predominates by a very large margin, but at least one manufacturer is fitting steel disk wheels as standard equipment and many others fit wire or disk wheels at the option of the purchaser. Semi-elliptic springs are used by a very large percentage of the total number of models, but a few use cantilever, platform, transverse, or three-quarter elliptic types.

Over half of the cars listed employ Hotchkiss drive. In one or two instances an adjustable spring shackle is fitted to make it possible to take up wear and thus prevent noise which would otherwise result. Improvements in this particular have long been recognized as desirable but little has been accomplished to date.

Gear ratio has continued to increase for several years past until the average now employed is 4.52 as against 4.38 last year. This is indicative of higher speed engines and a lower power factor or average engine load, a tendency which makes for lower fuel economy and one which should therefore be countenanced only if the advantage gained more than offsets the loss in fuel.

Specifications of American

MAKE AND MODEL	Wheelbase	Number of Cylinders	Bore and Stroke	Piston Displacement	Make of Engine	Cylinder Shape	Cam-shaft Drive	Water Circu-lation	LUBRICATION		CARBURETION		IGNITION			ELECTRIC SYSTEM		CLUTCH	
									System	Type of Pump	Make of Carbu-reter	Fuel Feed	Sys-tem	Make	Con-trol	Generator Make	Voltage	Make	Type
Ace.....G	123	6	3¼x5	248.9	Guy.....	I...	Worm..	Pump..	Splash-Pr.	Piston....	.....	Vacuum.	Single...	At Kent.....	Hand..	Auto-Lite....	6	Warner Gr..	Disk..
Allen.....43	110	4	3½x5	192.4	Own.....	L...	Helical.	Ther...	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Conn.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
American.....C	127	6	3¼x5	248.9	Hersh-Sp...	L...	Helical.	Pump..	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	G. & D.....	6	Borg & Beck.	Plate..
Anderson.....S-40	120	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump..	Splash-Pr.	Gear.....	Rayfield...	Vacuum.	Single...	Remy.....	Hand..	Remy.....	6	Borg & Beck.	Plate..
Apperson.....8-21	130	8	3¼x5	331.8	Own.....	L...	Helical.	Ther...	Pressure..	Gear.....	Johnson...	Vacuum.	Single...	Remy.....	Hand..	Bijur.....	6	Own.....	Plate..
Auburn.....6-39	120	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump..	Pressure..	Gear.....	Rayfield...	Vacuum.	Single...	Remy.....	Hand..	Remy.....	6	Borg & Beck.	Plate..
Beggs-Six.....20-T	120	6	3¼x4½	224.0	Cont.....	L...	Helical.	Pump..	Pressure..	.....	Stromberg.	Vacuum.	Single...	Conn.....	Hand..	Auto-Lite....	6	Borg & Beck.	Plate..
Bour Davis.....215	126	6	3½x5¼	303.1	Continental.	L...	Helical.	Pump.	Splash-Pr.	Piston....	Zenith....	Vacuum.	Single...	Westinghouse	Hand..	Westinghouse	6	Mun ie.....	Disk..
Brewster.....91	125	4	4 x5½	276.5	Own.....	K...	Chain..	Pump.	Pressure..	Gear.....	Zenith....	Vacuum.	Single...	Bosch.....	Hand..	U. S. L.....	12	Own.....	Cone..
Briscoe.....4-34	109	4	3⅜x5	178.9	Own.....	L...	Helical.	Ther...	Splash-Pr.	Piston....	Scoe.....	Gravity.	Single...	Conn.....	Hand..	Auto-Lite....	6	Own.....	Cone..
Buick.....1921	118	6	3⅜x4½	241.6	Own.....	I...	Helical.	Pump.	Splash-Pr.	Gear.....	Marvel....	Vacuum.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Cadillac.....59	132	8	3⅛x5⅛	314.4	Own.....	L...	Chain..	Pump.	Pressure..	Gear.....	Own.....	Pressure.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Case.....V	126	6	3½x5¼	303.1	Continental.	L...	Helical.	Pump.	Splash-Pr.	Piston....	Rayfield...	Vacuum.	Single...	Delco.....	H. & A.	Westinghouse	6	Borg & Beck.	Plate..
Chalmers.....6-30	117	6	3¼x4½	224.0	Own.....	L...	Chain..	Ther...	Splash-Pr.	Gear.....		Vacuum.	Single...	.....	Hand..	.....	6	Own.....	Disk..
Chalmers.....6-30	122	6	3¼x4½	224.0	Own.....	L...	Chain..	Ther...	Splash-Pr.	Gear.....		Vacuum.	Single...	.....	Hand..	.....	6	Own.....	Disk..
Champion.....Tourist	116	4	3½x5	192.4	Hersh-Sp...	L...		Ther...			Zenith....		Single...	Dyneto.....	Hand..	Dyneto.....		Borg & Beck.	Plate..
Champion.....Special	118	4	3½x5	192.4	Lycoming..	L...		Ther...			Zenith....		Single...	Dyneto.....	Hand..	Dyneto.....		Borg & Beck.	Plate..
Chandler.....123	123	6	3½x5	288.6	Own.....	L...	Chain..	Pump.	Splash-Pr.	Piston....	Rayfield...	Vacuum.	Single...	Bosch.....	Hand..	Bosch.....	6	Borg & Beck.	Plate..
Chevrolet.....490	102	4	3⅛x4	170.9	Own.....	I...		Pump.	Splash-Pr.	Gear.....	Zenith....	Gravity.	Single...	Remy.....	Hand..	.....		.....	Cone..
Chevrolet.....FB-50	110	4	3⅛x5¼	224.3	.....	I...		Pump.	Splash-Pr.	Gear.....	Zenith....	Vacuum.	Single...	Remy.....		Auto-Lite....			Cone..
Cleveland.....40	112	6	3 x4½	190.8	Own.....	I...	Chain..	Pump.	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Bosch.....	Hand..	Bosch.....	6	Borg & Beck.	Plate..
Climber.....S-6	125	6	3¼x5	248.9	Hersh-Sp...	L...	Helical.	Pump.	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Bosch.....	Hand..	Westinghouse	6	Muncie.....	Disk..
																		Hoosier.....	Plate.
Cole.....870	127	8	3½x4½	346.3	Northway..	L...	Helical.	Pump.		Gear.....	Johnson...	Vacuum.	Single...	Delco.....	H. & A.	Delco.....	6	Northway..	Cone..
Columbia Six.....DC	115	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Auto-Lite....	6	Borg & Beck.	Plate..
Comet.....	125	6	3½x5¼	303.1	Continental.	L...	Helical.	Pump.	Circ-Sp...	Piston....	Stromberg.	Vacuum.	Single...	.....	Hand..	Wagner.....	6	Borg & Beck.	Plate..
Commonwealth.....44	117	4	3½x5	192.4	Hersh-Sp...	L...	Helical.	Ther...	Circ-Sp...	Gear.....	Carter.....	Vacuum.	Single...	Splitdorf....	Hand..	Dyneto.....	6	Borg & Beck.	Plate..
Crawford.....21-6-40	122	6	3½x5¼	303.1	Continental.	L...	Helical.	Pump.	Circ-Sp...		Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Westinghouse	6	Brown-Lipe..	Disk..
Crow-Elkhart....L53-56	117	4	3½x5	192.4	Lycoming..	L...	Helical.	Ther...	Circ-Sp...	Piston....	Zenith....	Vacuum.	Single...	Conn.....	Hand..	Dyneto.....	6	Borg & Beck.	Plate..
Crow-Elkhart....H53-56	117	6	3½x5	230.1	Rutenber...	L...	Helical.	Pump.	Circ-Sp...	Piston....	Zenith....	Vacuum.	Single...	Conn.....	Hand..	Dyneto.....	6	Borg & Beck.	Plate..
Cunningham.....V-4	132	8	3¾x5	441.7	Own.....	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Delco.....	Auto..	Delco.....	6	Own.....	Disk..
Daniels 8.....D-19	132	8	3½x5¼	404.1	Own.....	L...	Helical.	Pump.	Pressure..	Gear.	Zenith....	Pressure.	Single...	Delco.....	Hand..	Delco.....	6	Own.....	Disk..
Davis.....51	120	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Delco.....	Hand..	Delco.....	6	Borg & Beck.	Plate..
Dodge Brothers.....	114	4	3⅞x4½	212.3	Own.....	L...	Helical.	Pump.	Circ-Sp...	Gear.....	Stewart...	Vacuum.	Single...	North-East.	Auto..	North-East.	15	Own.....	Disk..
Dort.....17-A	108	4	3½x5	192.4	Lycoming..	L...	Helical.	Ther...	Circ-Sp...	Piston....	Carter.....	Vacuum.	Single...	Conn.....	Hand..	Westinghouse	6	Own.....	Cone..
Dixie-Flyer.....H-S-70	112	4	3½x5	192.4	Hersh-Spill..	L...	Helical.	Ther...	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Eisemann...	Hand..	Dyneto.....	6	Borg & Beck.	Plate..
Dorris.....680	132	6	4 x5	377.0	Own.....	I...	Helical.	Pump.	Pressure	Gear.....	Stromberg.	Vacuum.	Single...	Bosch.....	Hand..	Westinghouse	6	Warner-Gr..	Disk..
Dupont.....A	124	4	3⅛x5	.....	Own.....	L...	Helical.	Pump.	Splash-Pr.	Gear.....	Yale & Town	Vacuum.	Single...	Eisemann...	Hand..	Westinghouse	6	Brown-Lipe..	Disk..
Elcar.....7-R	117	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Delco.....	Hand..	Delco.....	6	Warner Gr...	Disk..
Elgin Six.....K	.....	6	3⅛x4¾	218.6	Falls.....	I...	Helical.	Ther...	Splash-Pr.	Piston....	Stromberg.	Vacuum.	Single...	Wagner.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Essex.....A	108½	4	3⅜x5	178.9	Own.....	F...	Helical.	Ther...	Circ-Sp...	Piston....	Own.....	Vacuum.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Friend Four.....	112	4	3¼x4½	149.3	Own.....	I...	Helical.	Ther...	Pressure	Gear.....	Stromberg.	Vacuum.	Single...	Conn.....	Hand..	Wagner.....	6	Borg & Beck.	Plate..
Ferris.....130	130	6	3½x5¼	303.1	Continental.	L...	Helical.	Pump.	Pressure	Piston....	Zenith....	Vacuum.	Single...	.....	Hand..	Leece-N.....	6	Brown-Lipe..	Disk..
Franklin.....9-B	115	6	3¼x5¼	261.3	Own.....	I...	Helical.	None...	Pressure	Gear.....	Own.....	Vacuum.	Single...	At Kent.....	Auto..	Dyneto.....	12	Own.....	Plate..
Ford.....T	100	4	3¾x4	176.7	Own.....	L...	Spur...	Ther...	Circ-Sp...	.....	Holley....	Gravity.	Dual...	Own.....	Hand..	Own.....	6	Own.....	Fric..
Gardner.....“G”	112	4	3½x5	192.4	Lycoming..	L...	Helical.	Ther...	Circ-Sp...	.....	Carter.....	Vacuum.	Single...	Westinghouse	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Grant.....HX	116	6	3⅛x4½	198.9	Own.....	I...	Helical.	Ther...	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Bijur.....	6	Borg & Beck.	Plate.
Globe.....B-10	115	4	3⅜x5	178.9	Supreme...	.....	.....	Ther...	.....	.....	Stromberg.	Vacuum.	Single...	Delco.....	Hand..	Delco.....	6	Warren.....	.....
Hanson.....60	121	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Marvel....	Vacuum.	Single...	Delco.....	Hand..	Delco.....	6	Borg & Beck.	Plate..
Harroun.....A-A-2	106	4	3¼x5¼	174.2	Own.....	I...	Helical.	Ther...	Splash-Pr.	Piston....	Stromberg.	Vacuum.	Single...	Remy.....	Hand..	Remy.....	6	Own.....	Cone..
Halladay.....21	116	6	3½x5	230.1	Rutenber...	L...	Helical.	Pump.	Splash-Pr.	Eccentric.	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Hatfield.....A-42	115	4	3½x5	192.4	Hersh-Sp...	L...	Helical.	Ther...	Circ-Sp...	Gear.....	Zenith....	Vacuum.	Single...	Conn.....	Hand..	Dyneto.....	6	Borg & Beck.	Plate..
Haynes.....47	132	6	3½x5	288.6	Own.....	L...	Helical.	Pump.	Circ-Sp...	Piston....	Rayfield...	Vacuum.	Single...	Kingston....	Hand..	Leece-N.....	6	Borg & Beck.	Plate..
H. C. S.....Series 3	120	4	3⅝x5½	227.1	Weidely....	I...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Pressure.	Single...	Delco.....	Hand..	Delco.....	6	Warner-Gr...	Plate..
Holmes.....Series 4	126	6	3½x4¼	245.3	Own.....	I...	Helical.	None...	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Eisemann...	Auto..	Dyneto.....	12	Brown-Lipe..	Disk..
Hudson Super-Six....O	126	6	3½x5	288.6	Own.....	L...	Helical.	Pump.	Circ-Sp...	Plunger..	Own.....	Vacuum.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Hupmobile.....R	112	4	3¼x5½	182.5	Own.....	L...	Chain..	Ther...	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Westinghouse	6	Own.....	Disk..
Jackson.....6-38	121	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Remy.....	Hand..	Auto-Lite....	6	Borg & Beck.	Plate..
Jordan.....M	120	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	Delco.....	Hand..	Delco.....	6	Detroit.....	Plate..
Kenworthy.....8-90	130	8	3 x5¼	296.9	Own.....	I...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Vacuum.	Single...	.....	Hand..	Bijur.....	6	Brown-Lipe..	Disk..
Kissel Custom Built....	124	6	3⅛x5½	284.4	Own.....	L...	Helical.	Pump.	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Remy.....	Hand..	Remy.....	6	Warner-Gr...	Disk..
King.....H	120	8	3 x5	.....	Own.....	I...	Chain..	Ther...	Pressure..	Gear.....	Ball & Ball.	Vacuum.	Single...	At Kent.....	Hand..	Westinghouse	6	Detroit.....	Plate..
Kline Kar.....655-K	121	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Rayfield...	Vacuum.	Single...	Conn.....	Hand..	Wagner.....	6	Borg & Beck.	Plate..
LaFayette.....134	132	8	3¼x5¼	348.4	Own.....	L...	Chain..	Pump.	Splash-Pr.	Gear.....	Own.....	Pressure.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Lexington.....Series S	122	6	3¼x4½	224.0	Continental.	L...	Helical.	Pump.	Pressure..	Gear.....	Rayfield...	Vacuum.	Single...	Conn.....	Hand..	G. & D.....	6	Borg & Beck.	Plate..
Lexington.....Series T	128	6	3¼x4½	224.0	Ansted.....	I...	Helical.	Pump.	Pressure..	Gear.....	Rayfield...	Vacuum.	Single...	Conn.....	Hand..	G. & D.....	6	Own.....	Disk..
Liberty.....	117	6	3½x5	230.1	Own.....	L...	Helical.	Ther...	Splash-Pr.	Gear.....	Stromberg.	Vacuum.	Single...	Wagner.....	Hand..	Wagner.....	6	Borg & Beck.	Plate..
Locomobile.....48	142	6	4½x5½	524.8	Own.....	T...	Helical.	Pump.	Splash-Pr.	Gear.....	Ball & Ball	Pressure.	Double..	Berling.....	Hand..	Westinghouse	6	Own.....	Disk..
Lorraine.....21-T	114	4	3½x5	192.4	Hersh-Sp...	L...	Helical.	Ther...	Splash-Pr.	Gear.....	Johnson...	Vacuum.	Single...	Westinghouse	Hand..	Westinghouse	6	Borg & Beck.	Plate.
Lincoln.....	130	8	3⅝x5	357.8	Own.....	L...	Chain..	Pump.	Pressure..	Gear.....	Own.....	Vacuum.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Disk..
Maibohm.....B	116	6	3⅛x4¼	195.6	Falls.....	I...	Helical.	Ther...	Splash-Pr.	Piston....	Stromberg.	Vacuum.	Single...	At Kent.....	Hand..	Bijur.....	6	Borg & Beck.	Plate..
Meteor.....R&RR	129	4	4¼x6	340.4	Roc-Dues..	H...	Chain..	Pump.	Pressure..	Gear.....	Zenith....	Vacuum.	Single...	Simms.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Marmon.....34	136	6	3⅜x5½	339.7	Own.....	I...	Helical.	Pump.	Pressure..	Gear.....	Stromberg.	Gravity.	Single...	Delco.....	H. & A.	Delco.....	6	Own.....	Plate..
Maxwell.....25	109	4	3⅝x4½	185.8	Own.....	L...	Helical.	Ther...	Splash-Pr.	Piston....	.....	Vacuum.	Single...	.....	Hand..	.....	12	Own.....	Cone..
McFarlan.....1921	140	6	4½x6	572.5	Own.....	T...	Helical.	Pump.	.....	Gear.....	Rayfield...	Vacuum.	Dual....	Berling.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Mercer.....5	132	4	3¾x6¾	298.2	Own.....	L...	Chain..	Pump.	Pressure..	Gear.....	Ball & Ball	Vacuum.	Single...	Eisemann...	Hand..	Westinghouse	6	Own.....	Plate..
Merit.....B	119	6	3⅛x4½	.....	Walker.....	I...	Helical.	Ther...	Splash-Pr.	.....	Stromberg.	Vacuum.	Single...	At-Kent.....	Hand..	Westinghouse	6	Borg & Beck.	Plate..
Metz Master Six.....	120	6	3½x5	230.1	Rutenber...	I...	Helical.	Pump.	Splash-Pr.	Piston....	Stromberg.	Vacuum.	Single...	Conn.....	Hand..	G. & D.....	6	Borg & Beck.	Plate..
Mitchell.....	120	6	3¼x5	248.9	Own.....	L...	Helical.	Pump.	Splash-Pr.	.....	Rayfield...	Vacuum.	Single...	Remy.....	Hand..	Remy.....	.....	Borg & Beck.	Plate..
Moon.....6-48-21	122	6	3¼x4½	224.0	Continental.	.....	Helical.	Pump.	Pressure..	Gear.....	Rayfield...	Vacuum.	Single...	Delco.....	Auto..	Delco.....	6	Borg & Beck.	Plate..
Nash.....681	121	6	3¼x5	248.9	Own.....	I...	Helical.	Pump.	Splash-Pr.	Gear.....	Marvel....	Vacuum.	Single...	Wagner.....	H. & A.	Wagner.....	6	Borg & Beck.	Plate..

ABBREVIATIONS—¾ **Ell**—¾ Elliptic; ¾ **Float**—¾ Floating; **Amid**—Amidships; **Auto**—Automatic; **B & P**—Ball and Plain; **B & R**—Ball and Roller; **B R & P**—Ball, Roller and Plain; **Cant**—Cantilever; **Circ-Spl**—Circulating Splash; **Ell**—Elliptic; **F**—1 Valve in Head, 1 in Side; **Float**—Floating; **Fric**—Friction; **Gear**—Gear Pump; **H & A**—Hand and Automatic; **H**—Valves horizontal in side; **I**—I-Head; **K**—Knight Type; **L**—L-Head; **Opt**—Optional; **Plat**—Platform; **S-E**—Semi-Elliptic; **Semi-F**—Semi-Floating; **Sp. B**—Spiral Bevel;

Passenger Car Chassis for 1921

TRANSMISSION								RUNNING GEAR							BEARINGS			
GEARSET			Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type	Gear Ratio on Direct	TIRES		Wheels	Rear Springs	Make of Steering Gear	Make of Speedometer	Crankshaft Bearings and No.	Gear Set	Rear Axle	Front Wheel	MAKE AND MODEL
Make	Location.	Speeds						Front	Rear									
Warner Gr...	Unit E.	3	Sp. B...	Tor-A....	Salisbury.	Float...	4.56	32x4	32x4	Wood...	S-E....	Gemmer.....	Stewart....	Plain 3..	B.&R..	B.&R..	Roller..	Ace.....G
Own.....	Unit E.	3	Sp. B...	Springs..	Columoia.	¾ Float.	4.62	32x4	32x4	Wood...	S-E....	Ditweiler....	Stewart....	Plain 3..	B.&R..	Rollet..	Roller..	Allen.....43
Warner.....	Unit E.	3	Worm...	Springs..	Salisbury.	Float...	4.50	32x4	32x4	Opt.....	S-E....	Warner.....	.....	Plain 3..	B.&P..	B.&R..	Roller..	American.....C
Durston.....	Unit E.	3	Sp. B...	Springs..	Salisbury.	Float...	4.50	33x4	33x4	Opt.....	S-E....	Gemmer.....	Stewart....	Plain 4..	B.&P..	B.&R..	Roller..	Andersen.....S-40
Own.....	Amid...	3	Sp. B...	Springs..	Own.....	Semi-F..	4.25	34x4½	34x4½	Opt.....	¾-Ell..	Own.....	Van Sicklen.	Plain 3..	Roller..	Roller..	Roller..	Apperson.....8-21
Grant-Lees..	Unit E.	3	Sp. B...	Tor-A....	Salisbury.	Float...	4.75	33x4	33x4	Wood...	S-E....	Jacox.....	Stewart....	Plain 4..	Ball...	Ball....	Roller..	Auburn.....6-39
Detroit.....	Unit E.	3	Sp. B...	Springs..	Standpar.	¾ Float.	3.75	33x4	33x4	Wood...	S-E....	Ditweiler....	Stewart....	Plain 4..	B.&P..	Roller..	Roller..	Beggs-Six.....20-T
Muncie.....	Unit E.	3	Sp. B...	Springs..	Salisbury.	¾ Float.	4.50	33x4½	33x4½	Wood...	S-E....	Lavine.....	Stewart....	Ball 3...	Ball....	Roller..	Roller..	Bour-Davis.....21-S
Own.....	Unit T.	3	Sp. B...	Tor-T....	Own.....	Float...	4.25	32x4½	32x4½	Wood...	Cant....	Own.....	Stewart....	Plain 3..	Ball....	Ball....	Roller..	Brewster.....91
Own.....	Unit E.	3	Sp. B...	Springs..	Own.....	Semi-F..	4.18	31x4	31x4	Wood...	S-E....	Own.....	Stewart....	Plain 3..	B.&P..	B.&R..	Ball.?.	Briscoe.....4-34
Own.....	Unit E.	3	Bevel....	.....	Own.....	Float...	4.08	33x4	33x4	Wood...	Cant....	S.P.C.....	Stewart....	Plain 4..	Plain...	Roller..	Ball....	Buick.....1921
Own.....	Unit E.	3	Sp. B...	Springs..	Timken..	Float...	4.43	35x5	35x5	Wood...	Plat....	Own.....	Van Sicklen.	Plain 3..	B.&R..	Roller..	Roller..	Cadillac.....59
Grant-Lees..	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float.	4.87	34x4½	34x4½	Wood...	S-E....	Jacox.....	Van Sicklen.	Plain 3..	Ball....	Roller..	Roller..	Case.....V
Own.....	Unit E.	3	Sp. B...	Springs..	.....	Semi-F..	4.75	32x4	32x4	Wood...	S-E....	Own.....	.....	Plain...	B.&R..	Roller..	Roller..	Chalmers.....6-30
Own.....	Unit E.	3	Sp. B...	Springs..	.....	Semi-F..	5.18	33x4½	33x4½	Wood...	S-E....	Own.....	.....	Plain...	B.&R..	Roller..	Roller..	Chalmers.....6-30
Grant-Lees..	.....	3	Bevel....	.....	Columbia.	Float...	.....	32x3½	32x3½	Wood...	S-E....	.....	.....	.....	.....	Roller..	.....	Champion.....Tourist
Grant-Lees..	.....	3	Bevel....	.....	Columbia.	Float...	.....	32x4	32x4	Wood...	S-E....	.....	.....	.....	.....	.....	Roller..	Champion.....Special
Own.....	Unit E.	3	Sp. B...	Springs..	Own.....	Float...	4.40	33x4	33x4	Wood...	S-E....	C.A.S.....	Stewart....	Plain 3..	Ball....	Ball....	Roller..	Chandler.....
.....	.....	3	.....	.....	.....	¾ Float.	.....	30x3½	30x3½	Wood...	Cant....	.....	.....	Plain 3..	.....	Roller..	.....	Chevrolet.....490
.....	.....	3	.....	.....	.....	¾ Float.	.....	33x4	33x4	Wood...	S.E-S.C..	.....	.....	.....	.....	Roller	Ball....	Chevrolet.....FB-50
Mechanics..	Unit E.	3	Sp. B...	Springs..	Own.....	Semi-F..	4.45	32x4	32x4	Wood...	S-E....	C.A.S.....	Van Sicklen.	Plain 3..	Ball....	Roller..	Roller..	Cleveland.....40
Muncie.....	Unit E.	3	Sp. B...	Springs..	.....	Semi-F..	4.75	32x4½	32x4½	Wood...	S-E....	C.A.S.....	Van Sicklen.	Plain 4..	Roller..	Ball....	Roller..	Climber.....S-6
Northway...	Unit E.	3	Sp. B...	Springs..	Columbia.	Float...	4.45	33x5	33x5	Wood...	S-E....	Gemmer.....	Stewart....	Plain 3..	B.&P..	Roller..	Roller..	Cole.....870
Durston.....	Unit E.	3	Sp. B...	Springs..	Timken..	¾ Float.	5.10	32x4	32x4	Wood...	Cant....	Gemmer.....	.....	Plain 4..	Ball....	Roller..	Roller..	Columbia Six.....D.C.
Munice.....	Unit E.	3	Sp. B...	Tor-A....	Columbia.	¾ Float.	6.66	33x4	33x4	Opt.....	Cant....	Gemmer.....	Stewart....	Plain 3..	Roller..	Roller..	Roller..	Comet.....
Muncie.....	Unit E.	3	Sp. B...	Springs..	Peru.....	Float...	4.25	32x4	32x4	Wood...	S-E....	C.A.S.....	Van Sicklen.	Plain 2..	Plain..	Roller..	Ball....	Commonwealth.....44
Brown-Lipe..	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	4.45	32x4	32x4	Wood...	S-E....	Lavine.....	Stewart....	Plain 3..	Roller..	Roller..	Roller..	Crawford.....21-6-40
Covert.....	Unit E.	3	Sp. B...	Springs..	Peru.....	Float...	4.25	32x3½	32x3½	Opt.....	Ell.....	Ditweiler....	Stewart....	Plain...	Roller..	Roller..	Roller..	Crow-Elkhart....L53-56
Covert.....	Unit E.	3	Sp. B...	Springs..	Peru.....	Float...	4.25	33x4	33x4	Opt.....	Ell.....	Ditweiler....	Stewart....	Plain...	Ball....	Roller..	Roller..	Crow-Elkhart....H53-56
Own.....	Unit E.	3	Sp. B...	Springs..	Timken..	Float...	4.08	35x5	35x5	Opt.....	¾ Ell..	Gemmer.....	Warner....	Plain 3..	B.&R..	Roller..	Roller..	Cunningham.....V-4
Own.....	Unit E.	3	Sp. B...	Tor-A....	Timken..	Float...	3.50	34x4½	34x4½	Opt.....	S-E....	Gemmer.....	Stewart....	Plain 3..	Ball....	Roller..	Roller..	Daniels 8.....D-19
Warner.....	Unit E.	3	Sp. B...	Tor-A....	Timken..	¾ Float.	5.90	33x4	33x4	Wood...	S-E....	Warner.....	.....	Plain 4..	Ball....	Roller..	Roller..	Davis.....51
Own.....	Unit E.	3	Sp. B...	Tor-T....	Own.....	Float...	4.16	32x3½	32x3½	Opt.....	¾ Ell..	Own.....	.....	Plain 3..	Roller..	Roller..	Roller..	Dodge Brothers.....
Mechanics..	Unit E.	3	Bevel...	Springs..	Flint.....	¾ Float.	4.07	31x4	31x4	Opt.....	Cant....	S.P.C.....	Stewart....	Plain 2..	B.&P..	Roller..	Roller..	Dort.....17-A
Grant-Lees..	Unit E.	3	Sp. B...	Tor-T....	.....	Float...	4.72	32x4	32x4	Opt.....	¾ Ell..	C.A.S.....	Van Sicklen.	Plain 2..	Ball....	Roller..	Roller..	Dixie Flyer.....H-S-70
Warner-Gr..	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	3.35	33x5	33x5	Wood...	S-E....	Ross.....	Van Sicklen.	Plain 7..	Ball....	Roller..	Roller..	Dorris.....680
Brown-Lipe..	Unit E.	4	Sp. B...	Springs..	Columbia.	Float...	4.45	32x4	32x4	Opt.....	S-E....	Jacox.....	Warner....	Plain 3..	Roller..	Roller..	Roller..	Dupont.....A
Warner Gr...	Unit E.	3	Sp. B...	Springs..	Salisbury.	¾ Float.	4.50	33x4	33x4	Opt.....	S-E....	Gemmer.....	Stewart....	Plain 4..	Ball....	B.&R..	Roller..	Elcar.....7-R
Mechanics..	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float.	5.10	33x4	33x4	Wood...	Cant....	C.A.S.....	Van Sicklen.	Plain 3..	Ball....	Ball....	Roller..	Elgin Six.....K
Own.....	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	4.66	32x4	32x4	Wood...	S-E....	Gemmer.....	.....	Plain 3..	Roller..	Roller..	Roller..	Essex.....A
Own.....	Unit E.	3	Sp. B...	Tor-A....	Peru.....	Float...	4.60	32x3½	32x3½	Wood...	Trans..	Warner.....	.....	Plain 2..	B.&R..	B.&R..	Roller..	Friend Four.....
Brown-Lipe..	Unit E.	.....	Sp. B...	Tor-A....	Columbia.	¾ Float.	4.08	32x4½	32x4½	Wire....	S-E....	Gemmer.....	.....	Plain 3..	Ball....	Ball....	Roller..	Ferris.....
Own.....	Amid...	3	Sp. B...	Springs..	Own.....	Semi-F..	4.33	32x4	32x4	Wood...	Ell.....	Own.....	Stewart....	Plain 7..	Ball....	Ball....	Ball....	Franklin.....9-B
Own.....	Unit E.	2	Bevel...	R-R-T-A.	Own.....	Semi-F..	3.63	30x3	30x3½	Wood...	S-E....	Own.....	.....	Plain 3..	Plain..	Roller..	B.&R..	Ford.....T
Mechanics..	Unit E.	3	Bevel...	Springs..	Flint.....	¾ Float.	4.41	32x3½	32x3½	Wood...	S-E....	Ditweiler....	Stewart....	Plain 2..	Roller..	B.&R..	Roller..	Gardner.....G
Durston.....	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float	4.66	32x4	32x4	Wood...	S-E....	Jacox.....	Van Sicklen.	Plain 3..	Plain..	Roller..	Roller..	Grant.....HX
.....	Unit E.	3	Sp. B...	Springs..	Eaton....	Semi-F..	4.90	32x4	32x4	Wood...	S-E....	Gemmer.....	.....	.....	.....	.....	.....	Globe.....B-10
Detroit.....	Unit E.	3	Sp. B...	Springs..	Timken..	¾ Float.	4.66	32x4	32x4	Wood...	S-E....	Gemmer.....	Stewart....	Plain 4..	Ball....	Roller..	Roller..	Hanson.....60
Grant-Lees..	Unit E.	3	Bevel...	Springs..	Adams...	¾ Float.	4.00	30x3½	30x3½	Wood...	Cant....	Gemmer.....	Stewart....	Plain 3..	Ball....	B.&R..	Roller..	Harroun.....A-A-2
Grant-Lees..	Unit E.	3	.....	.....	.....	¾ Float.	.....	33x4	33x4	Wood...	¾ Ell..	Ditweiler....	Stewart....	Ball-2..	.....	Roller..	Roller..	Halladay.....21
Grant-Lees..	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float.	4.63	32x4	32x4	Wood...	S-E....	Gemmer.....	Stewart....	Plain 2..	Ball....	Roller..	Roller..	Hatfield.....A-42
Own.....	Unit E.	3	Sp. B...	Springs..	Own.....	¾ Float.	4.77	34x4½	34x4½	Wood...	S-E....	Jacox.....	Stewart....	Plain 3..	B.&R..	Ball....	Ball....	Haynes.....47
Warner Gr...	Unit E.	3	Sp. B...	Tor-A....	Own.....	¾ Float.	.....	32x4½	32x4½	Wire....	S-E....	Gemmer.....	.....	Plain 3..	Ball....	B.&R..	Roller..	H. C. S.....Series 3
Brown-Lipe..	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	4.90	34x4½	34x4½	Wood...	Ell.....	Gemmer.....	Van Sicklen.	Plain 7..	B.&R..	Roller..	Roller..	Holmes.....Series 4
Own.....	Amid...	3	Sp. B...	Springs..	Timken..	Semi-F..	4.90	34x4½	34x4½	Wood...	S-E....	Gemmer.....	Stewart....	Plain 4..	Roller..	Roller..	Roller..	Hudson Super Six....O
Own.....	Unit E.	3	Sp. B...	Springs..	Own.....	¾ Float.	4.87	32x4	32x4	Wood...	S-E....	Jacox.....	.....	Plain 3..	B.R.P..	B.&R..	Ball....	Hupmobile.....R
Covert.....	Unit E.	3	Sp. B...	Springs..	Salisbury.	¾ Float.	4.75	32x4½	32x4½	Steel....	S-E....	Own.....	.....	Plain 4..	Ball....	Roller..	Roller..	Jackson.....6-38
Detroit.....	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	4.66	32x4	32x4	Wood...	S-E....	Gemmer....	Van Sicklen.	Plain 4..	B.&P..	Roller..	Roller..	Jordan.....M
Brown-Lipe..	Amid...	3	Sp. B...	Springs..	Columbia.	¾ Float.	4.08	32x4½	32x4½	Opt.....	S-E....	Ross.....	Warner....	Plain...	Ball....	Roller..	Roller..	Kenworthy.....890
Own.....	Unit E.	3	Bevel...	Tor-A....	Columbia.	Float...	4.87	32x4½	32x4½	Wood...	Cant....	Jacox.....	.....	Plain 3..	B.&R..	Roller..	Roller..	King.....H
Warner Gr...	Unit E.	3	Sp. B...	Springs..	Own.....	Float...	4.25	32x4½	32x4½	Wire....	S-E....	Jacox.....	Stewart....	Plain 3..	B.&P..	Roller..	Roller..	Kissel Custom Built.....
Grant-Lees..	Unit E.	3	Sp. B...	Springs..	Stanpar..	Semi-F..	4.56	33x4	33x4	Wood...	¾ Ell..	Wholrab....	Stewart....	Plain 4..	Ball....	Roller..	Roller..	Kline Kar.....6-55-K
Own.....	Unit E.	3	Sp. B...	Tor-T....	Own.....	Float...	4.50	33x5	33x5	Wood...	S-E....	Own.....	Waltham...	Plain 5..	B.&R..	Roller..	Roller..	LaFayette.....134
Warner Gr...	Unit E.	3	Sp. B...	Springs..	Own.....	¾ Float.	4.62	32x4	32x4	Opt.....	S-E....	C.A.S.....	Stewart....	Plain 4..	B.&R..	Ball....	Ball....	Lexington.....Series S
Warner Gr...	Unit E.	3	Sp. B...	Springs..	Own.....	¾ Float.	4.62	32x4½	32x4½	Wood...	S-E....	C.A.S.....	Stewart....	Plain 3..	B.&R..	Ball....	Ball....	Lexington.....Series T
Detroit.....	Unit E.	.....	Sp. B...	Springs..	Timken..	Semi-F..	.....	32x4	32x4	Wood...	S-E....	Gemmer.....	Stewart....	Plain 4..	Ball....	Roller..	Roller..	Liberty.....
Own.....	Amid...	4	Sp. B...	R-R-T-A.	Own.....	Float...	3.87	35x5	35x5	Wood...	¾ Ell..	Own.....	Stewart....	Plain 7..	Ball....	Ball....	Roller..	Locomobile.....48
Munice.....	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float.	4.63	32x4	32x4	Wood...	S-E....	Ditweiler....	Van Sicklen.	Plain 2..	.....	Roller..	Roller..	Lorraine.....21-T
Own.....	Unit E.	3	Sp. B...	Tor-T....	Timken..	Float...	4.45	33x5	33x5	Opt.....	S-E....	Own.....	.....	Plain 5..	B.&R..	Roller..	Roller..	Lincoln.....
Munice.....	Unit E.	3	Sp. B...	Springs..	Peru.....	Float...	4.50	32x3½	32x3½	Wood...	S-E....	Jacox.....	Stewart....	Plain 3..	Ball....	Roller..	Roller..	Maibohn.....B
Own.....	Amid...	.....	Sp. B...	Springs..	Stanpar..	¾ Float.	3.92	32x4½	32x4½	Wire....	Ell.....	Gemmer.....	Warner....	Plain 4..	Ball....	Roller..	Rollet..	Meteor.....R&RR
Own.....	Unit T.	3	Sp. B...	Tor-T....	Own.....	¾ Float.	3.75	33x5	33x5	Wire....	Trans..	Own.....	Van Sicklen.	Plain 3..	B.R.P..	B.&R..	Roller..	Marmon.....34
Own.....	Unit E.	3	Bevel...	Springs..	Own.....	¾ Float.	.....	30x3½	30x3½	Wood...	S-E....	Own.....	.....	Plain 2..	Roller..	Roller..	Ball....	Maxwell.....25
Brown-Lipe..	Amid...	3	Sp. B...	Tor-A....	Timken..	Float...	3.50	33x5	33x5	Opt.....	S-E....	Warner.....	Stewart....	Plain 4..	Roller..	Rollet..	Roller..	McFarlan.....1921
Own.....	Amid...	4	Sp. B...	Springs..	Own.....	Float...	3.22	32x4½	32x4½	Opt.....	S-E....	Gemmer.....	Stewart....	Plain 3..	Roller..	B.&R..	Roller..	Mercer.....5
Grant-Lees..	Unit E.	3	Sp. B...	Springs..	Columbia.	¾ Float.	5.10	32x4	32x4	Opt.....	S-E....	Ditweiler....	Stewart....	Plain 3..	B.&P..	B&R..	Roller..	Merit.....B
Brown-Lipe..	Unit E.	3	Sp. B...	Springs..	Timken..	¾ Float.	4.67	32x4	32x4	Wood...	S-E....	Own.....	.....	Plain 3..	Roller..	Roller..	Roller..	Metz Master Six.....
.....	Amid...	3	.....	Tor-T....	Own.....	Float...	4.41	33x4	33x4	Wood...	Cant....	.....	.....	Plain 3..	B.&R..	B.&R..	Roller..	Mitchell.....
Warner.....	Unit E.	3	Sp. B...	Springs..	Timken..	Semi-F..	4.66	32x4	32x4	Opt.....	S-E....	Warner.....	Stewart....	Plain 4..	Ball....	Roller..	Roller..	Moon.....6-48-21
Own.....	Unit E.	3	Sp. B...	Springs..	.....	Semi-F..	4.50	33x4	33x4	Wood...	S-E....	Gemmer.....	Stewart....	Plain 3..	P.&R..	Roller..	Roller..	Nash.....681

Splash-Pr—Splash Pressure; **Spur**—Spur Gears; **T**—T-Head; **Ther**—Thermo-Syphon; **Tor-A**—Torsion Arm; **Tor-T**—Torsion Tube; **Trans**—Transverse; **Unit-E**—Unit with Engine; **Unit-T**—Unit with Torque Tube; **Unit-A**—Unit with Axle. **EQUIPMENT—At Kent**—Atwater Kent; **Conn**—Connecticut; **G. & D.**—Gray & Davis; **Hersh-Sp**—Herschell-Spillman; **Leece-N**—Leece-Neville; **Roc-Dues**—Rochester Duesenberg; **S. P. C.**—Saginaw Products Co.; **West-M**—Weston-Mott.

Specifications of American Pass

MAKE AND MODEL	Wheelbase	Number of Cylinders	Bore and Stroke	Piston Displacement	Make of Engine	Cylinder Shape	Cam-shaft Drive	Water Circu-lation	LUBRICATION		CARBURETION		IGNITION				ELECTRIC SYSTEM		CLUTCH	
									System	Type of Pump	Make of Carbu-reter	Fuel Feed	Sys-tem	Make	Con-trol	Generator Make	Voltage	Make	Type
NashFour	112	4	3¼x5	.....	Own	I	Helical	Pump	Circ-Sp	Gear	Schebler	Vacuum	Single	Wagner	Hand	Wagner	6	Borg & Beck	Plate
National....Sextet B.B.	130	6	3½x5¼	303.1	Own	I	Chain	Pump	Pressure	Gear	Rayfield	Vacuum	Single	Delco	H. & A.	Westinghouse	6	Borg & Beck	Plate
Oakland.....34-C	115	6	2⅞x4¾	177.0	Own	I	Helical	Pump	Pressure	Gear	Marvel	Vacuum	Single	Remy	Hand	Remy	6	Own	Plate
Oldsmobile.....43-A	115	4	3⅛x5¼	224.3	Own	I	Helical	Pump	Splash-Pr	Gear	Zenith	Vacuum	Single	Remy	Hand	Auto-Lite	6	Hoosier	Plate
Overland.....4	100	4	3⅛x4	143.1	Own	L	Helical	Ther	Splash	.....	Tillotson	Gravity	Single	Conn	Hand	Auto-Lite	6	Own	Plate
Packard.....Single Six	116	6	3⅜x4½	241.6	Own	L	Chain	Pump	Pressure	Gear	Own	Vacuum	Single	Delco	Auto	At-Kent	6	Own	Disk
Packard.....Twin Six	136	12	3 x5	424.1	Own	L	Chain	Pump	Pressure	Gear	Own	Pressure	Single	Delco	Auto	Bijur	6	Own	Disk
Paige.....6-42	119	6	3¼x5	248.9	Own	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Single	At-Kent	H. & A.	G. & D	6	Borg & Beck	Plate
Paige.....6-66	131	6	3¾x5	331.4	Continental	L	Helical	Pump	Splash-Pr	Gear	Rayfield	Vacuum	Single	At-Kent	H. & A.	G. & D	6	Borg & Beck	Plate
Paterson.....650	120	6	3¼x4½	224.0	Continental	L	Helical	Pump	Pressure	Gear	Stromberg	Vacuum	Single	Delco	Hand	Delco	6	Borg & Beck	Plate
Peerless	125	8	3¼x5	331.8	Own	L	Helical	Pump	Pressure	Gear	Ball & Ball	Vacuum	Single	At-Kent	H. & A.	Auto-Lite	6	Own	Disk
Piedmont.....4-30	116	4	3½x5	192.4	Lycoming	L	Helical	Ther	Splash-Pr	Piston	Ball & Ball	Vacuum	Single	Delco	Hand	Dyneto	6	Borg & Beck	Plate
Piedmont.....6-40	122	6	3¼x4½	224.0	Continental	L	Helical	Pump	Splash-Pr	Piston	Stromberg	Vacuum	Single	Remy	Hand	Remy	6	Borg & Beck	Plate
Pierce-Arrow	138	6	4 x5½	414.7	Own	T	Helical	Pump	Pressure	Gear	Stromberg	Pressure	Single	Delco	H. & A.	Delco	6	Own	Disk
Pan.....A	108	4	3¼x5	165.9	Own	I	Chain	Ther	Circ-Sp	Piston	Rayfield	Vacuum	Single	Westinghouse	Hand	Westinghouse	6	Borg & Beck	Plate
Pan American...E-6-55	121	6	3¼x5	248.9	Hersh-Sp	L	Helical	Pump	Splash-Pr	Gear	Rayfield	Vacuum	Single	Westinghouse	Hand	Westinghouse	6	Borg & Beck	Plate
Pilot.....6-50	126	6	3¼x5	248.9	Hersh-Sp	L	Helical	Pump	Spl sh-Pr	Gear	Tillotson	Vacuum	Single	Conn	Hand	Bijur	6	Borg & Beck	Plate
Porter.....46	142	4	4⅜x6⅜	478.4	Own	I	Helical	Pump	Pressure	Gear	Zenith	Pressure	Single	Berling	Hand	Westinghouse	12	Own	Plate
Premier.....6-D	126¾	6	3⅜x5½	295.3	Own	I	Helical	Pump	Splash-Pr	Gear	Johnson	Vacuum	Single	Delco	Hand	Delco	6	Borg & Beck	Plate
Premo Car.....6-40-A	117	6	3¼x4¼	195.6	Falls	I	Helical	Ther	Splash-Pr	.....	Zenith	Vacuum	Single	Conn	.....	Dyneto	.....	Borg & Beck	Plate
Raleigh	122	6	3¼x5	248.9	Hersh-Sp	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Single	Bosch	Hand	Westinghouse	6	Borg & Beck	Plate
Ranger	116	4	3⅜x5	178.9	Own	I	Helical	Ther	Splash-Pr	Gear	Zenith	Gravity	Single	Conn	Hand	Bijur	6	Borg & Beck	Plate
Reo.....T-6	120	6	3⅜x5	239.4	Own	F	Helical	Pump	Circ-Sp	Eccentric	Rayfield	Vacuum	Dual	Northeast	Hand	Northeast	6	Own	Plate
Reamer.....6-54-D	130	6	3½x5¼	303.1	Continental	F	Spur	Pump	Splash-Pr	Piston	Stromberg	Vacuum	Single	Bosch	Hand	Bijur	6	Borg & Beck	Plate
Rock Falls.....14000	136	6	3¾x5	331.4	Continental	L	Helical	Pump	Splash-Pr	Gear	Rayfield	Vacuum	Single	Bosch	Hand	Westinghouse	6	Borg & Beck	Plate
R. & V. Knight.....J	127	6	3½x4½	259.8	Own	K	Chain	Ther	Pressure	Gear	Stromberg	Vacuum	Single	Wagner	Hand	Wagner	6	Borg & Beck	Plate
R. & V. Knight.....R	116	4	3¾x5	220.9	Own	K	Chain	Ther	Pressure	Gear	Stromberg	Vacuum	Single	Wagner	Hand	Wagner	6	Borg & Beck	Plate
Saxon.....125	112	4	3⅜x5	178.9	Root & Van	I	Helical	Ther	Pressure	.....	Stromberg	Vacuum	Single	Wagner	H. & A.	Wagner	6	Detlaff	Disk
Sayers Six.....D.P.	118	6	3¼x4½	224.0	Continental	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Single	Delco	Hand	Delco	6	Borg & Beck	Plate
Scripps Booth.....B-39	115	6	2⅞x4¾	177.0	Northway	F	Helical	Pump	Pressure	Gear	Marvel	Vacuum	Single	.....	Hand	Remy	6	.....	Cone
Seneca	108	4	3¼x4½	138.1	Le Roi	L	Helical	Ther	Splash-Pr	.....	Schebler	Vacuum	Single	Conn	Hand	Allis-Chalm	6	Borg & Beck	Plate
Skelton.....35	112	4	3½x5	192.4	Lycoming	L	Helical	Ther	Circ-Sp	Piston	Carter	Vacuum	Single	Conn	Hand	Westinghouse	6	Borg & Beck	Plate
Standard.....I	127	8	3¼x5	331.8	Own	L	Helical	Pump	Pressure	Gear	Zenith	Vacuum	Double	At-Kent	Hand	Westinghouse	6	Borg & Beck	Disk
Stanwood-Six	118	6	3¼x4½	224.0	Cont	L	Helical	Pump	Pressure	Gear	Stromberg	Vacuum	Single	At-Kent	Hand	Westinghouse	6	Borg & Beck	Plate
Steven-Duryea.....E	138	6	4 x5½	510.4	Own	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Dual	Berling	Hand	Westinghouse	6	Own	Plate
Stearns-Knight...SKL-4	125	4	3⅝x5⅝	248.5	Own	K	Chain	Pump	Pressure	Gear	S hebler	Vacuum	Single	At Kent	Hand	Westinghouse	12	Own	Disk
Stephens.....90	122	6	3¼x4½	224.0	Own	I	Helical	Ther	Pressure	Gear	Tillotson	Vacuum	Single	Conn	Hand	Auto-Lite	6	Borg & Beck	Plate
Studebaker.....Big 6	126	6	3⅜x5	353.8	Own	L	Helical	Pump	Splash-Pr	Gear	Ball & Ball	Vacuum	Single	Wagner	Hand	Wagner	6	Own	Cone
Studebaker.....Spec. 6	119	6	3½x5	288.6	Own	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Single	Wagner	Hand	Wagner	6	Own	Cone
Studebaker.....EJ	112	6	3½x4½	207.1	Own	L	Chain	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Single	Wag. & Rem	Auto	Wag. & Rem	6	Own	Plate
Stutz.....K & H	130	4	4½x6	360.8	Own	T	Helical	Pump	Pressure	Gear	Stromberg	Pressure	Dual	Delco	Hand	Remy	6	Own	Disk
Templar.....445	118	4	3⅜x5½	196.8	Own	I	Chain	Pump	Pressure	Gear	Stromberg	Vacuum	Single	Simms	Hand	Bijur	6	Borg & Beck	Plate
Tulsa	117½	4	3½x5	192.4	Hersh-Sp	L	Helical	Ther	Splash-Pr	Gear	Zenith	Vacuum	Single	Conn	Hand	Dyneto	6	Borg & Beck	Plate
Velie.....34	112	6	3¼x4¼	195.6	Falls	I	Helical	Ther	Circ-Sp	Gear	Stromberg	Vacuum	Dual	At-Kent	H. & A.	Westinghouse	6	Borg & Beck	Plate
Velie.....48	115	6	3¼x4½	224.0	Continental	L	Helical	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Dual	At-Kent	H. & A.	Bijur	6	Borg & Beck	Plate
Westcott.....C-38	118	6	3¼x4½	224.0	Continental	L	Helical	Pump	Pressure	Gear	Rayfield	Vacuum	Single	Delco	H. & A.	Delco	6	Borg & Beck	Plate
Westcott.....C-48	125	6	3½x5¼	303.1	Continental	L	Helical	Pump	Splash-Pr	Gear	Rayfield	Vacuum	Single	Delco	H. & A.	Delco	6	Warner Gr	Plate
Willys-Knight.....20	118	4	3⅛x4½	185.8	Own	.....	Chain	Ther	Circ-Sp	Gear	Tillotson	.....	Single	Conn	Hand	Auto-Lite	6	Own	Plate
Winton.....25	132	6	3¾x5½	347.9	Own	L	Chain	Pump	Pressure	Gear	Stromberg	Vacuum	Single	.....	Hand	Bijur	6	.....	Disk
Wasp	132	4	4¾x5½	389.9	Wisconsin	T	Spur	Pump	Splash-Pr	Gear	Stromberg	Vacuum	Dual	Bosch	Hand	Westinghouse	6	M. & E	Plate

Received Too Late to Insert in Preceding Table

Ambassador.....R	136	12	2⅞x5	389.5	.....	I	Helical	Pump	.....	.....	Stromberg	Vacuum	Single	.....	.....	Westinghouse	....	.....	Disk
Leach Power Plus...Six	128	6	3½x5	288.6	Continental	L	Helical	Pump	Splash-Pr	Piston	Rayfield	Vacuum	Single	Delco	Hand	Delco	6	Brown-Lipe	Disk
Northway	128	6	3½x5¼	303.1	Own	I	Helical	Pump	Splash-Pr	.....	Special	Vacuum	.....	Special	.....	Special	....	Brown-Lipe	Disk

ABBREVIATIONS—¾ **Ell**—¾ Elliptic; ¾ **Float**—¾ Floating; **Amid**—Amidships; **Auto**—Automatic; **B & P**—Ball and Plain; **B & R**—Ball and Roller; **B R & P**—Ball, Roller and Plain; **Cant**—Cantilever; **Circ-Spl**—Circulating Splash; **Ell**—Elliptic; **F**—I Valve in Head, 1 in Side; **Float**—Floating; **Fric**—Friction; **Gear**—Gear Pump; **H & A**—Hand and Automatic; **H**—Valves horizontal in side; **I**—I-Head; **K**—Knight Type; **L**—L-Head; **Opt**—Optional; **Plat**—Platform; **S-E**—Semi-Elliptic; **Semi-F**—Semi-Floating; **Sp. B**—Spiral Bevel;

General Average and Percentage Figures Based on Data in Above Table

General Averages

Horsepower, S.A.E. rating	25.87
Bore	3.43
Stroke	4.93
Stroke bore ratio	1.43
Displacement	293.48
Wheelbase	120.77
Gear Ratio	4.52
Tires	32 x 4
Number Chassis	132
Number makes	117

Engine Starting

Electric Starter	100 per cent
Acetylene Starter	none
Air	none
Optional	none
Mechanical	none
No Starter stock	none

Fuel Feed

Gravity	4.70 per cent
Gravity Pressure	none
Pressure	7.10 per cent
Vacuum	88.20 per cent

Type of Clutch

Disk	92.10 per cent
Cone	7.90 per cent
Expanding band	none
Contracting band clutch	none
Cone	none
Electric	none

Location of Gearset

Amidship	9.50 per cent
Unit with axle	0.95 per cent
Unit with engine	88.00 per cent
Unit with torque tube	1.55 per cent

enger Car Chassis for 1921—Continued

TRANSMISSION							Gear Ratio on Direct	RUNNING GEAR				Make of Steering Gear	Make of Speedometer	Crankshaft Bearings and No.	BEARINGS			MAKE AND MODEL
GEARSET			Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type		TIRES		Wheels	Rear Springs				Gear Set	Rear Axle	Front Wheel	
Make	Location	Speeds						Front	Rear									
Own	Unit E.	3	Sp. B.	Springs.	Own.	Semi-F.	4.50	32x4	32x4	Wood.	S-E.	Gemmer.	Stewart.	Plain 3.	Roller.	Roller.	Roller	Nash-Four
Brown-Lipe.	Unit E.	3	Sp. B.	Tor-A.	Columbia.	Float.	4.08	32x4½	32x4½	Wood.	S-E.	Warner.	Warner.	Plain 3.	B.&R.	Roller.	Roller.	National.....Sextet BB
Muncie	Unit E.	3	Bevel	Springs.	West-M.	Float.	4.50	32x4	32x4	Wood.	S-E.	Jacox	Stewart.	Plain 3.	Ball.	B.&R.	Ball.	Oakland.....34-C
Warner	Unit E.	3	Sp. B.	Tor-T.	Own.	Semi-F.	4.66	32x4	32x4	Wood.	S-E.	Jacox	Stewart.	Plain 3.	Ball.	Roller.	Ball.	Oldsmobile.....43-A
Own	Unit E.	3	Sp. B.	Springs.	Own.	¾ Float.	4.50	30x3½	30x3½	Wood.	Cant.	Own	Stewart.	Plain 3.	B.&R.	Ball.	Roller.	Overland.....4
Own	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.30	33x4½	33x4½	Wood.	S-E.	Own	Stewart.	Plain 7.	Ball.	Roller.	Roller.	Packard . . . Single Six
Own	Unit E.	3	Sp. B.	Springs.	Own.	Semi-F.	4.36	35x5	35x5	Wood.	S-E.	Own	Waltham.	Plain 3.	Ball.	Ball.	Roller.	Packard.....Twin Six
Own	Unit E.	3	Sp. B.	Springs.	Salisbury.	¾ Float.	4.75	32x4	32x4	Wood.	S-E.	Jacox	Stewart.	Plain 3.	B.&R.	B.&R.	Roller.	Paige.....6-42
Own	Unit E.	3	Sp. B.	Springs.	Salisbury.	¾ Float.	4.55	35x4½	33x4½	Wood.	S-E.	Jacox	Stewart.	Plain 4.	B.&R.	B.&R.	Roller.	Paige.....6-66
Durston	Unit E.	3	Sp. B.	Springs.	S-P & Sal.	S-F & F.	4.50	33x4	33x4		S-E.	Jacox	Stewart.	4				Paterson.....650
Own	Unit E.	3	Sp. B.	Springs.	Own.	¾ Float.	4.90	34x4½	34x4½	Wood.	Plat.	Gemmer.	Van Sicklen.	Plain 3.	Ball.	B.&R.	Roller.	Peerless
Grant-Lees.	Unit E.	3	Sp. B.	Springs.		Float.	4.50	32x3½	32x3½	Wood.	S-E.	Ditweiler.	Stewart.	Plain 3	Roller.	Roller.	Roller.	Piedmont.....4-30
Grant-Lees.	Unit E.	3	Sp. B.	Springs.	Spacke.	¾ Float.	4.50	32x4	32x4	Wood.	S-E.	Lavine.	Stewart.	Plain 3.	Roller.	Roller.	Roller.	Piedmont.....6-40
Own	Amid.	3	Sp. B.	Tor-A.	Own.	Semi-F.	4.28	35x5	35x5	Wood.	S-E.	Own	Waltham.	Plain 7.	B.&P.	B.&R.	Roller.	Pierce-Arrow
Own	Unit E.	3	T-Worm.	Springs.	Own.	Semi-F.	4.90	33x4	33x4	Wood.	S-E.	Gemmer.	Stewart.	Ball 2.	B.&P.	Roller.	Roller.	Pan.....A
Detroit	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.90	33x4	33x4	Wood.	S-E.	C.A.S.	Stewart.	Plain 3.	Ball.	Roller.	Roller.	Pan American.....E-6-55
Muncie	Unit E.	3	Sp. B.	Springs.	Columbia.	¾ Float.	4.50	32x4½	32x4½	Wood.	S-E.	Ditweiler.	Stewart.	Plain 3.	Ball.	Ball.	Roller.	Pilot.....6-50
Own	Amid.	4	Sp. B.	Tor-A.	Own.	Float.	3.25	35x5	35x5	Wood.	Ell.	Own.	Warner.	Plain 3.	Ball.	Ball.	Ball.	Porter.....46
Own	Unit E.	3	Sp. B.	Springs.	Stanpar.	Semi-F.	4.50	33x5	33x5	Wood.	S-E.	Own.	Stewart.	Plain 3.	B.&R.	Roller.	Roller.	Premier.....6-D
Muncie	Unit E.	3		Springs.	Timken.	Semi-F.		32x3½	32x3½	Wood.	S-E.	Ditweiler.	Stewart.					Premocar.....6-40-A
Grant-Lees.	Unit E.	3	Sp. B.	Springs.	Spacke.	Float.	4.90	32x4½	32x4½	Opt.	S-E.	Gemmer.	Stewart.	Plain 3.	Ball.	Ball.	Roller.	Raleigh
Detroit	Unit E.	3	Sp. B.	Springs.	Columbia.	¾ Float.	4.60	32x4	32x4	Wood.	S-E.	Jacox	Stewart.	Plain 3.	Ball.	Roller.	Roller.	Ranger
Own	Amid.	3	Sp. B.	Springs.	Own.	Semi-F.	4.66	33x4	33x4	Wood.	S-E.	Own		Plain 4.	Roller.	Roller.	Roller.	Reo.....T-6
Grant-Lees.	Unit E.	3	Sp. B.	Springs.		¾ Float.	3.87	32x4½	32x4½	Wire.	Cant.	Jacox	Warner.	Plain 3.	Roller.	Roller.	Roller.	Roamer.....6-54-D
Grant-Lees.	Unit E.	3	Sp. B.	Springs.	Columbia.	¾ Float.	4.87	35x5	35x5	Wood.	¾ Ell.	Gemmer.	Warner.	Plain 4.	Roller.	Roller.	Roller.	Rock Falls.....14000
Brown-Lipe.	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.90	32x4½	32x4½	Opt.	S-E.	Jacox	Stewart.	Plain.	B.&R.		Roller.	R & V Knight.....J
Brown-Lipe.	Unit E.	3	Sp. B.	Springs.	Salisbury.	Float.	4.75	32x4	32x4	Opt.	S-E.	Jacox	Stewart.	Plain 3.	B.R.P.	Plain.	Roller.	R & V Knight.....R
Covert	Unit E.	3	Sp. B.	Tor-A.	Adams.	Semi-F.	4.75	32x4	32x4	Wood.	Tr. S-E.	C.A.S.	Stewart.	Plain 2.	B.&R.	Roller.	Roller.	Saxon.....125
Grant-Lees.	Unit E.	3	Sp. B.	Springs.	Stanpar.	Semi-F.	4.75	33x4	33x4	Wood.	S-E.	Lavine.	Stewart.	Plain 4.	Ball.	Roller.	Roller.	Sayers Six.....D.P.
Warner	Unit E.	3	Sp. B.	Springs.	Central.		4.87	32x4	32x4	Wood.	S-E.	Jacox	Stewart.	Plain 3.	B.&P.	B.&R.	Ball.	Scripps-Booth.....B-39
Warren	Unit E.	3	Sp. B.	Tor-A.	Peru.	Float.	4.75	30x3½	30x3½	Wood.	Cant.	Ditweiler.	Stewart.	Plain 2.	Ball.	Roller.	Roller.	Seneca
Muncie	Unit E.	3	Sp. B.	Springs.	Peru.	Float.	4.25	32x3½	32x3½	Wood.	S-E.	C.A.S.	Stewart.	Plain 2.	Ball.	B.&R.	Roller.	Skelton.....35
Grant-Lees.	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.45	34x4½	34x4½	Wood.	S-E.	Gemmer.	Stewart.	Plain 3.	Ball.	Roller.	Roller.	Standard.....T
Grant-Lees.	Unit E.	3			Standpar.	¾ Float.		33x4	33x4	Wood.	¾ Ell.	Gemmer.	Stewart.	Plain.	Roller.	Roller.	Roller.	Stanwood-Six
Own	Unit E.	3	Sp. B.	Tor-T.	Own.	Float.	3.94	35x5	35x5	Wood.	¾ Ell.	Own.	Waltham.	Plain 4.	B.&P.	Ball.	Ball.	Stevens-Duryea.....E
Own	Unit E.	3	Sp. B.	Tor-A.	Own.	Semi-F.	4.50	34x4½	34x4½	Wood.	Cant.	Own		Plain 3.	B.&R.	B.&R.	Roller.	Stearns Knight.....SKL4
Mechanics	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.90	31x4½	33x4½	Wood.	S-E.	C.A.S.	Stewart.	Plain 3.	Ball.	Roller.	Roller.	Stephens.....90
Own	Amid.	3	Sp. B.	Springs.	Own.	Semi-F.	3.71	33x4½	33x4½	Wood.	S-E.	Own	Van Sicklen.	Plain 4	Roller.	Roller.	Roller.	Studebaker.....Big-6
Own	Amid.		Sp. B.	Springs.	Own.	Semi-F.	4.33	32x4	32x4	Wood.	S-E.	Own	Van Sicklen.	Plain 4.	Roller.	Roller.	Roller.	Studebaker.....Spec.-6
Own	Amid.	3	Sp. B.	Springs.	Own.	Semi-F.	4.55	32x4	32x4	Wood.	S-E.	Own	Stewart.	Plain 4.	Roller.	Roller.	Roller.	Studebaker.....EJ
Own	Unit A.	3	Sp. B.	Tor-A.	Own.	Semi-F.	3.50	32x4½	32x4½	Wire.	S-E.	Gemmer.	Stewart.	Plain 3.	Ball.	B.&R.	Roller.	Stutz.....K & H
Detroit	Unit E.	3	Sp. B.	Springs.	U.S.	Semi-F.	4.40	32x4	32x4	Wood.	S-E.	Jacox	Warner.	Plain 3.	B.&P.	B.&R.	Roller.	Templar.....445
Muncie	Unit E.	3	Sp. B.	Springs.	Salisbury.	Float.	4.50	33x4	33x4	Opt.	S-E.	C.A.S.	Stewart.	Plain 1.	B.&P.	B.&R.	Roller.	Tulsa
Durston	Unit E.	3	Sp. B.	Springs.	Columbia.	¾ Float.	4.63	33x4	33x4	Wood.	S-E.	Gemmer.	Stewart.	Plain 3.	Ball.	B.&R.	Roller.	Velie.....34
Durston	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.60	33x4½	33x4½	Wood.	¾ E.	Gemmer.	Stewart.	Plain 4.	B.&P.	Roller.	Roller.	Velie.....48
Warner Gr.	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	5.09	33x4	33x4	Wood.	S-E.	Gemmer.	Van Sicklen.	Plain 4.	B.&R.	Roller.	Roller.	Westcott.....C-38
Warner Gr.	Unit E.	3	Sp. B.	Springs.	Timken.	Semi-F.	4.45	32x4½	32x4½	Wood.	S-E.	Gemmer.	Van Sicklen.	Plain 3.	B.&R.	Roller.	Roller.	Westcott.....C-48
Own	Unit E.		Sp. B.	Springs.	Own.	Semi-F.	5.00	33x4	33x4	Wood.	S-E.	Own.	Warner.	Plain 3.	B.&R.	Roller.	Roller.	Willys Knight.....20
	Unit E.	4	Sp. B.	Tor-A.		Float.	4.90	35x5	35x5	Wood.	S-E.		Warner.	Plain 4.	B.&R.	Roller.	Roller.	Winton.....25
Dundore	Unit E.	4	Sp. B.	Tor-T.	Timken.	Float.	3.70	33x5	33x5	Wire.	S-E.	Gemmer.	Warner.	Plain 4.	B.&R.	Roller.	Roller.	Wasp

Received Too Late to Insert in Preceding Table

	Unit E.		Sp. B.	T-A.	Timken.	Float.	4.45	32x4½	32x4½		S-E.			Plain 3.	Roller.	Roller.	Roller.	Ambassador.....R
Brown-Lipe.	Unit E.	3	Sp. B.	Springs.	Timken.	¾ Float.	4.50	32x4½	32x4½	Opt.	S-E.	Lavine.	Waltham.	Plain 3.	B.&R.	Roller.	Roller.	Leach Power Plus. . . Six
Brown-Lipe.	Unit E.	3	Sp. B.	Springs.		Float.	4.10	33x5	33x5	Wood.	S-E.			Plain 3.				Northway

Splash-Pr—Splash Pressure; **Spur**—Spur Gears; **T**—T-Head; **Ther**—Thermo-Syphon; **Tor-A**—Torsion Arm; **Tor-T**—Torsion Tube; **Trans**—Transverse; **Unit-E**—Unit with Engine; **Unit-T**—Unit with Torque Tube; **Unit-A**—Unit with Axle. **EQUIPMENT—At Kent**—Atwater Kent; **Conn**—Connecticut; **G. & D.**—Gray & Davis; **Hersh-Sp**—Herschell-Spillman; **Leece-N**—Leece-Neville; **Roc-Dues**—Rochester Duesenberg; **S. P. C.**—Saginaw Products Co.; **West-M**—Weston-Mott.

Final Drive

Straight bevel	8.40 per cent
Chain	none
Worm	1.60 per cent
Spiral bevel	90.00 per cent

Type of Axle

Floating	31.40 per cent
Semi-floating	34.60 per cent
Three-quarter	34.00 per cent

Timing Gear Drive

Spur gear	2.50 per cent
Helical or spiral	77.70 per cent
Silent chain	19.00 per cent
Worm	0.80 per cent
Bevel	none

Number of Cylinders

One	none
Two	none
Four	33.00 per cent
Six	57.70 per cent
Eight	8.50 per cent
Twelve	0.80 per cent

Shape of Cylinder

I-head	26.30
L-head	62.60
T-head	4.00
Knight type	3.10
H-head	0.90
F-head	3.10

Cooling

Air cooled	0.90 per cent
Thermo-syphon	31.80 per cent
Pump circulating	67.30 per cent

Ignition Systems

Single	92.55
Dual	6.55 per cent
Double	0.90 per cent
Duplex	none

Engine Lubrication

Splash	0.80 per cent
Splash-pressure	60.00 per cent
Pressure	39.20 per cent

Growth of Motor Vehicle Production Capacity

Merchandising effort must be directed to supplying a market for production capacity if plant and equipment are to be efficiently utilized. Both passenger car and truck production increased during 1920, while tractor production also went ahead. 750,000 vehicle replacements estimated to be necessary at present time.

IN the present status of the automotive industry, the fact that there were produced in 1920

Passenger cars	1,906,000
Trucks	335,000
Tractors	200,000

is of minor importance. The question confronting the industry to-day is that of equalizing the capacity for production and the capacity for absorption of these vehicles.

The problem of possible absorption is not to be a part of this article. In the registration article which precedes these pages, the present status of ownership is discussed and the development to date is shown by curves. The sales executive can extend these curves according to his own ideas. There are very strong variables to be considered. The wealth and buying disposition of the people are the most important of the unknown factors. No man can determine these factors for his neighbor. We all look to the future through our own glasses. One factor in this variable can be illustrated in this way: In a highly prosperous year, such as 1919, there will be a sharp demand for new cars from owners who believe that their old car is shabby. Every sales executive knows the difference between this urge during the first and second half of 1920. The factor that caused this difference was entirely apart from anything that the automotive industry could control. Call it psychological, or by whatever name you will, it practically destroyed for the time being the replacement market.

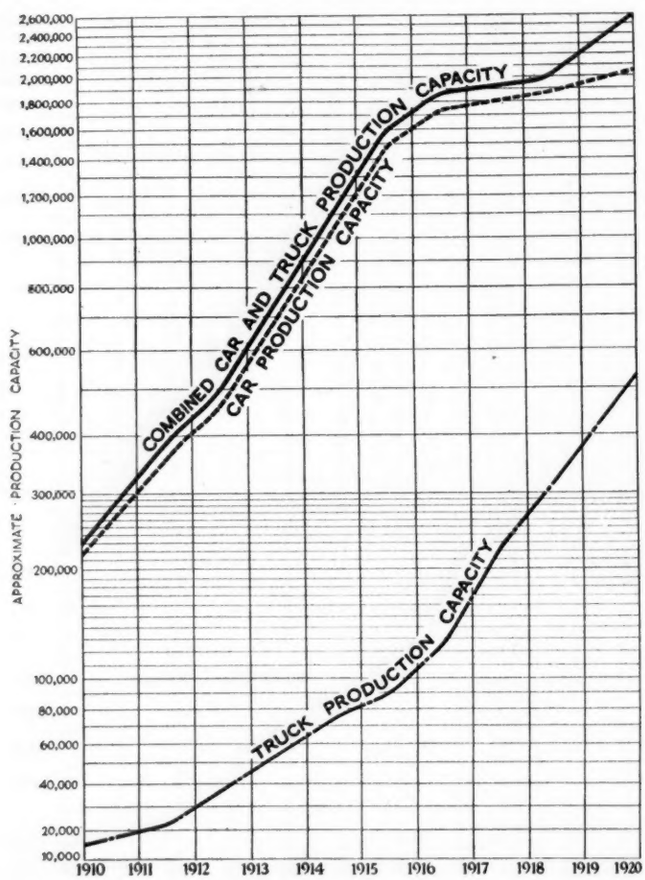


Fig. 1

In connection with this article there are printed several charts on production. Some of these are based on actual production. Others are based on production of selected years. In the latter charts the years selected are those during which we have reason to believe that the production was practically at capacity. To make this production capacity curve representative of a growing industry, the year's production has been charted as of July 1, midyear, so that the upward sweep of the chart for the latter half of the year may represent the capacity under construction. The figures for 1920 are based on actual records for the first half of the year, with allowances based on a questionnaire to a large number of manufacturers.

Present Production Problems

When the business slump hit the automotive industry along with the rest about last July, it found a very large number of manufacturers with half-completed projects for expansion and additions. Some of these unfinished projects were so large in particular cases as to contemplate a production capacity increase of 100 per cent or more. Other additions were smaller in scope, but twelve months ago a large majority of automotive manufacturing plants were not only striving for maximum production from their then present facilities, but had actually started building or expansion work of some kind.

Final production figures for 1920 showed a total of 2,241,000 cars and trucks. Production had slumped off very considerably during the last six months of the year. Consequently, it is evident that the production capacity of even the old plants and equipment was well above the actual production figure for that period. When the partly completed additions are taken into consideration as well—additions which were in many instances practically ready to start production—the actual production capacity figure mounts even higher.

The chart shown in Fig. 1 indicates that this potential

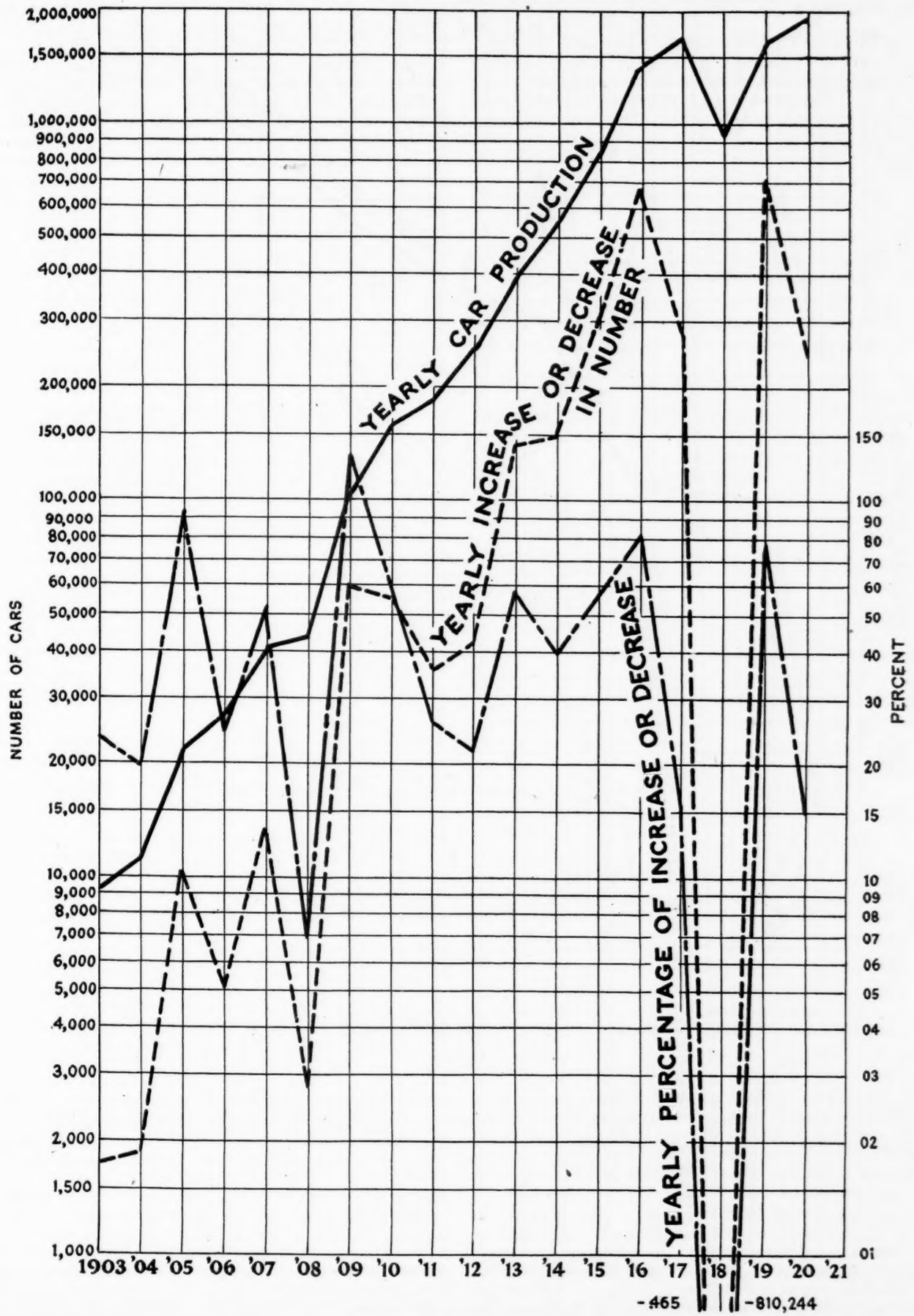

YEARLY CAR PRODUCTION
YEARLY INCREASE OR DECREASE IN NUMBER
YEARLY PERCENTAGE OF INCREASE OR DECREASE
NUMBER OF CARS
PERCENT
2,000,000
1,500,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
150,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
15,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,500
1,000
150
100
90
80
70
60
50
40
30
20
15
10
09
08
07
06
05
04
03
02
01
1903 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16 '17 '18 '19 '20 '21
-465
-810,244

Fig. 2

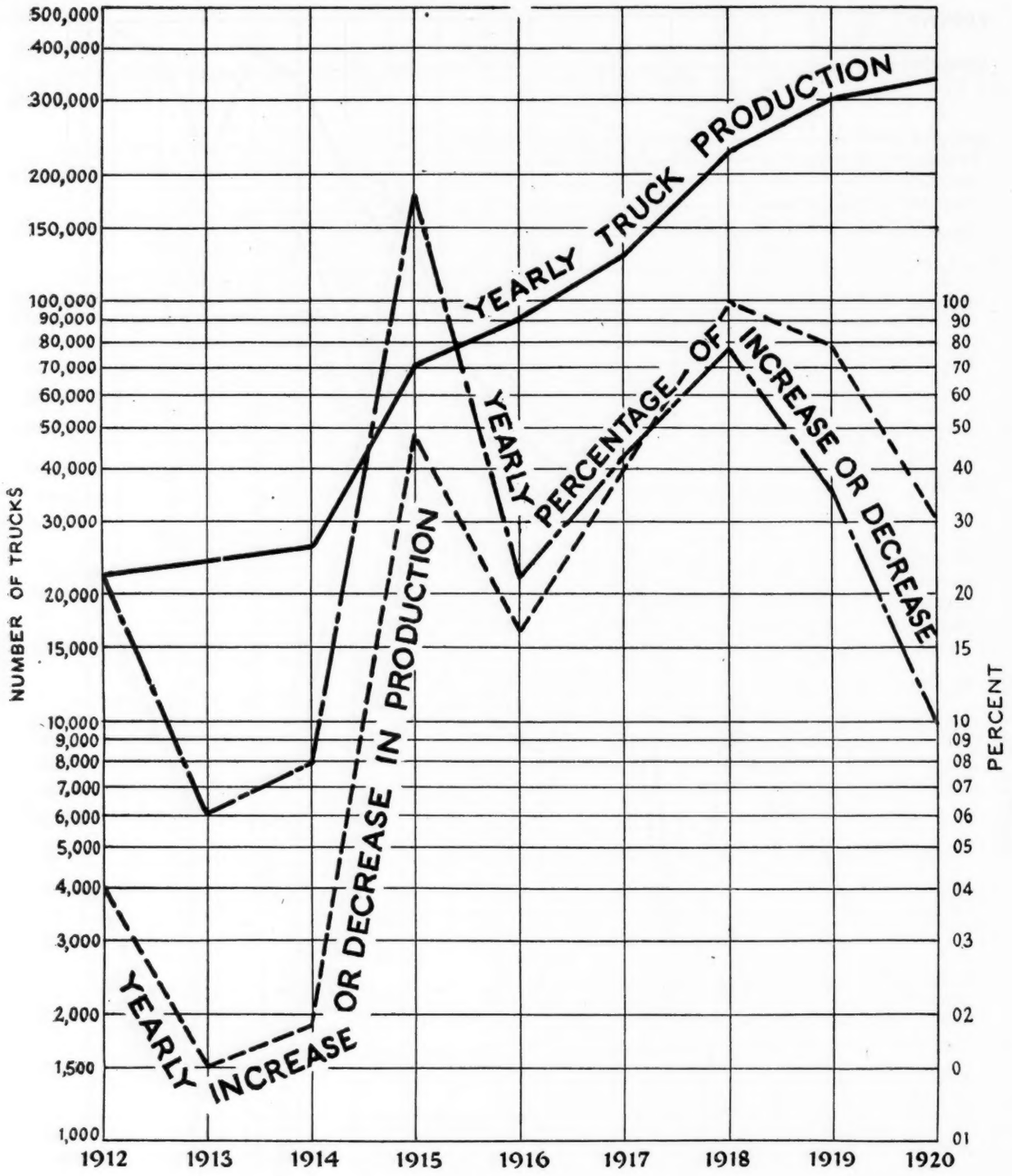


Fig. 3

capacity at the end of 1920 was 2,660,000 cars and trucks, 419,000 more than the number of vehicles actually produced. In other words, to operate their plants at maximum efficiency, the automobile manufacturers will have to provide a market for 419,000 cars and trucks more than were produced during 1920.

To do this during 1921 would be a very large task, but to lay a foundation for the future is both possible and necessary. One fact should be recognized by manufacturers, however, in planning for future production and sales development, namely, that one of two things must take place if every manufacturer is to prosper to the fullest extent.

1—Markets, either domestic or foreign, must be developed to absorb an actual yearly production of this size before any additions to plant capacity are made;
(or) 2—This potential production capacity must be reduced by turning the buildings and equipment to manufacturing other materials or units.

What will actually happen, however, will probably be neither of these things. Instead few manufacturers will probably be able to "prosper to the fullest extent of their production capacity" for some time to come. Each one is likely to prosper more nearly to the extent of his merchandising capacity during 1921.

As individual merchandising effort becomes more effective and potential markets are more fully developed,

however, the status of the industry as a whole will be improved and facilities will be provided for the absorption of the production of its entire capacity.

A study of the registration figures and an analysis of the possibilities of properly organized foreign merchandising point strongly to the fact that the first alternative mentioned can readily be achieved if intelligent and efficient effort is put forth. There are undoubtedly potential markets for more cars each year than would be represented by the production of all the plants working at their full capacity as shown by the highest figure in the production capacity chart. And as the production men struggled during the last few years to meet the demands of the sales department, upon the sales department now rests the fundamental task of meeting the requirements of the production possibilities.

The chart shown in Fig. 2 shows the climb of actual car production since 1903, together with the yearly increase or decrease in number and percentage. The production line itself is marked by a steady climb, unbroken except for the war year 1918. The largest per cent of increase in production was in 1909, while the largest increase in actual numbers occurred in 1919.

Yearly truck production shows an even more steady growth than that of passenger cars, since the war was an impetus rather than a retardation to truck production. Yet the production curves for both cars and trucks show exactly what would be expected in the case of a young, growing industry. This is shown in Figs. 2 and 3. At some future time the production line for both cars and trucks may be expected to become almost horizontal, but there is no indication that this will occur within the next few years.

Truck production showed its greatest percentage of increase during 1915, while the greatest actual increase came in 1918, when the demands of the U. S. Government for trucks were added to those of our allies.

Replacements

In considering future markets and production, the question of replacements inevitably plays an important part. Various difficulties enter into an accurate estimate of replacements, but figures close enough to indicate general trends can be compiled. The following table shows the number of replacements in the United States during the last six years. In obtaining these results exports have been taken into consideration. Replacements during this period were approximately as follows:

Year	Registration	Increase	Built	Exported	U. S.	Scrapped
1914	1,768,000	.....	569,000	26,000	543,000	.....
1915	2,479,000	708,000	892,000	64,000	828,000	120,000
1916	3,584,000	1,105,000	1,583,000	81,000	1,502,000	397,000
1917	4,992,000	1,408,000	1,868,000	80,000	1,788,000	380,000
1918	6,105,000	1,113,000	1,153,000	47,000	1,106,000	.....
1919	7,596,000	1,491,000	1,974,000	82,000	1,892,000	401,000
1920	8,915,000	1,319,000	2,241,000	172,000	2,069,000	750,000

This estimate does not take into consideration the number of cars in the hands of dealers on Jan. 1, the date on which the table is based.

The apparent absence of replacements in 1918 is due probably to a very widespread rejuvenation of old cars during the war and a somewhat decreased production during the same period. It may also be attributed somewhat to the previous uncertain condition of registration figures in one or two States, which consequently showed rather complete registration figures for the first time.

Rise in Value of Product

The chart in Fig. 4 shows the steady rise in the wholesale value of the cars and trucks manufactured since 1910. As would be expected the highest figure is that for 1920, the two billion mark being passed for the first time during last year. This is an increase of about 13.31 per cent over 1919.

Tractor production is not as well defined as is production in other lines in the automotive industry. The record of production available is accurate for the four years, 1916 to 1919. The figures were gathered by Federal Bureau of Public Roads. There are no accurate figures available for 1920. The figures used in the following tabulation for 1920 are from records of parts makers who supply tractor manufacturers. This is the tabulation carried out for 1920:

	1916	1917	1918	1919	1920
Manufactured	29,670	62,742	132,697	164,590	200,000
Sold in the U. S...	27,819	49,504	96,470	136,162	150,000
Sold for export ...	.....	14,854	36,351	19,693	15,000
On hand Dec. 31 ..	.....	15,525	15,401	27,740	60,000

So far as parts makers have heard from their customers, the prospects for 1921 are roughly that about 75 per cent of 1920 production will be turned out during 1921.

The increase of the potential capacity of the tractor industry is difficult to estimate. There is no organization which has this information. Recently a number of tractor manufacturers were asked to estimate the increased capacity of the industry. Most of them replied that they lacked the information necessary to make such an estimate. The sales manager of one of the oldest and largest manufacturing plants in the industry replied that his plant had an increased capacity of 570 per cent over Jan. 1, 1915. His estimate was that the capacity of the industry had been increased ten to fifteen times during the period mentioned.

Another large manufacturer estimated the increased capacity of the industry during this period as 400 per cent.

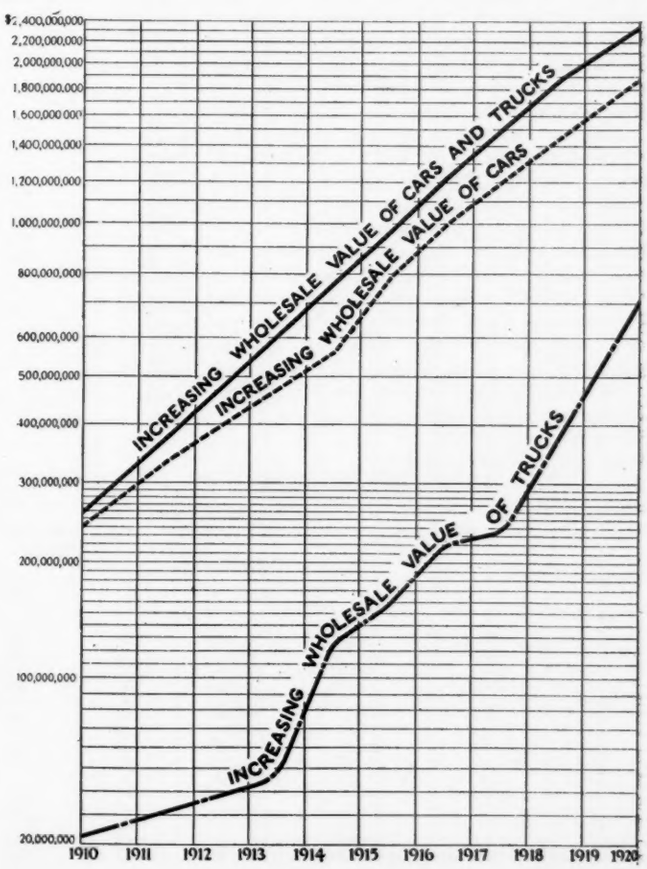


Fig. 4—Increasing wholesale value of cars and trucks plotted by big production years

Automotive Exports from England, France and Italy Increase

Value of complete cars and trucks exported from England in 1920 four times that of 1919 total, while Italy exports two-and-one-half times as much during first half of 1920 as during entire previous year. France also shows big gain, passing the billion francs mark for first time.

THE value of exported automotive products rose during 1920 for England, France and Italy. About four times as many complete cars and trucks were exported from the United Kingdom during 1920 as during 1919. The value of tires and tubes exported during 1920 shows a total of about 150 per cent more than the previous year.

French automotive exports increased in value 971,970,000 francs over the 1919 total, while Italian exports more than doubled in value. The tables presented in this article give all the detailed data available at this time on the exports from these three countries.

French Exports

In 1913, the last year unaffected by war conditions, the French automobile industry exported to the value of about 227 million francs. The following year the volume of business was on an increasing scale until the war clouds burst, but with five months of war the total was less than for the preceding year. During 1919 the volume of business was higher than in 1914, while by 1920 all records had been broken. Figures for only the first eleven months of the year are available, but these show a total of 1096 million francs, and on the assumption that December is equal to the average of the previous eleven months, this gives a total in round figures of 1200 million francs of export business for the year.

These figures give the impression of a most wonderful revival on the part of France, particularly in view of the fact that general depression prevailed for nearly one-half of the past year. In order to completely understand these figures, however, it is necessary to bear in mind the method under which exports are valued by the French authorities. The official figures consider the metric tonnage of automobiles exported, and a value is given to these for statistical purposes. In 1914 the value per metric ton for all classes of passenger cars was 850 francs. By 1915 this had been increased to 1150 francs; in 1916 the value

French Automobile Exports from 1914 to 1920.

Value of Exports in FRANCS.

	1914	1915	1916	1917	1918	1919	1920 (11 Months)
Great Britain	35,106,800	16,734,800	2,445,000	112,300	1,600	11,539,500	252,391,500
Germany	12,290,300	.....	.....	.....	.....	465,000	9,469,500
Belgium	14,141,400	.....	.....	15,600	.....	12,234,000	192,214,500
United States	1,726,400	3,459,200	1,864,200	150,200	31,200	2,187,000	14,955,000
Argentina	5,843,700	902,800	815,900	289,600	143,500	733,500	15,078,000
Italy	3,751,600	6,052,100	3,836,300	1,007,800	897,900	4,539,000	22,281,000
Switzerland	3,253,900	505,200	362,600	739,600	487,400	2,791,500	33,666,000
Spain	5,267,000	4,574,400	2,910,700	766,600	396,200	27,025,500	209,595,000
Egypt	587,300	392,900	196,600	32,800	14,000	153,000	5,952,000
Mexico	393,100	13,800	.....	.....	.....	3,000	6,666,000
Brazil	2,230,700	294,400	232,400	48,300	12,500	.....	10,177,500
Russia	3,559,800	24,455,800	62,308,000	0,842,700	.....	3,255,000	1,527,000
Holland	50,800	1,068,400	53,000	.....	.....	2,001,000	7,690,500
Portugal	2,093,000	1,108,000	657,200	205,100	218,400	5,170,500	18,718,500
Austria	654,500	.....	.....	.....	.....	.....	366,000
British India	350,700	1,307,600	17,200	39,900	.....	141,000	6,729,000
Denmark	95,500	378,900	199,700	.....	.....	1,401,000	8,725,500
Chili	1,054,800	471,800	298,000	.....	73,300	54,000	1,609,500
Turkey	1,267,200	.....	.....	.....	.....	448,900	4,212,000
Uruguay	96,900	62,100	65,600	.....	.....	606,000	4,393,500
Roumania	395,300	82,800	4,154,100	9,310,100	.....	2,637,000	6,766,500
Colombia	270,200	66,000	12,200	.....	.....	.....	660,000
Australia	522,800	136,900	109,200	.....	.....	.....	219,000
Canada	203,400	.....	.....	.....	.....	.....	255,000
Dutch Indies	.....	621,600	.....	.....	.....	.....	.....
Other Countries	9,664,100	3,295,160	3,664,183	1,263,040	992,290	3,133,100	52,158,000
French Colonies	18,642,950	3,781,380	4,335,870	1,460,100	854,490	43,990,500	210,003,000
Total	123,514,250	69,766,040	88,537,953	36,283,740	4,122,780	124,509,000	1,096,479,000

Exports of Automobiles and Parts from United Kingdom, 1906-1920.

Year	MOTORCYCLES COMPLETE		PARTS	CARS AND TRUCKS COMPLETE		CHASSIS		PARTS	TIRES AND TUBES	AIRPLANES AIRSHIPS AND PARTS
	No.	Value, £	Value, £	No.	Valu, £	No.	Value, £	Value, £	Value, £	Value, £
1906	739	23,077	27,511	1379	495,399	.....	323,395 (a)	.....	.....	.....
7	800	27,970	25,252	2318	857,647	.....	467,311 (a)	.....	.....	.....
8	1048	37,206	20,148	2216	800,636	225	75,984	381,939 (b)	.....	.....
9	1884	69,141	36,294	2580	952,431	221	85,356	525,818 (b)	.....	.....
1910	3341	122,582	37,894	3555	1,376,886	564	213,536	1,015,105 (b)	.....	15,486
11	7350	278,856	79,110	4536	1,804,419	735	296,689	1,085,130 (b)	.....	18,480
12	13055	528,496	186,378	5277	2,023,715	1180	437,224	1,221,529 (b)	.....	21,796
13	16850	733,269	217,330	7595	2,396,369	1234	465,283	788,239	708,924	46,756
14	20877	958,473	280,531	6054	1,972,226	1436	679,696	780,876	515,545	19,677
15	10927	510,374	230,883	3279	1,129,469	483	187,181	560,866	664,998	170,466
16	12847	594,969	258,692	2483	1,197,886	566	268,504	755,069	1,199,066	282,187
17	14159	898,254	204,001	1565	743,527	658	373,487	688,870	1,108,636	660,980
18	5652	363,104	156,138	2893	2,036,635	65	38,756	418,829	1,163,623	539,945
19	8330	575,848	322,140	1515	1,057,991	676	468,105	1,075,078	2,421,906	696,992
1920	21304	1,672,903	667,654	5325	3,929,455	3124	2,474,877	1,986,410	6,500,761	1,918,470

(a) Includes parts. (b) Includes tires and tubes.

Note: Figures during the war period include merchandise exported for Governments of the Allies but not for British Forces.

was 1500 francs, and in 1920 a metric ton of automobiles was considered to be worth 3000 francs.

If the fact is taken into consideration that the value of French automobiles exported to foreign countries is now calculated at about 3.5 times higher than 1914, it is found that the number of cars sent out of the country is really less than before the war. The coefficient adopted by the French Treasury Department is roughly correct, the only objection that could be made against it being that it is rather high for the cheaper grades of cars, for which a coefficient of 2.6 might have been employed.

The figures of French automobile exports during the war, which are here published for the first time, are of considerable interest. Russia headed the list in 1915 with nearly twenty-four and a half million francs worth of vehicles—evidently army trucks. The following year this amount had grown to more than sixty-two million francs; for 1917 it dropped to less than 21 million francs, and in 1918 France sent nothing to Russia. In three years Russia received nearly 108 million francs worth of French automobiles; how much of this she paid for is not known.

The year 1918 was the low water mark of French automobile exports, the total being only slightly more than four million francs. At that time, of course, the French factories were fully occupied with war orders, and Russia having fallen away no war trucks were being sent to that country.

Italian Exports

THE Italian automobile industry reached the high water mark of its export business in 1917, when trucks and touring cars to the value of 114,978,805 liras were sent out of the country. The great bulk of this business consisted of army trucks supplied to France and England, with a small number to the American Forces then in France.

The year 1918, the last of the war, showed a falling off in the volume of export business, the figure being rather more than 45 million liras; this was owing to the fact that the Italian automobile factories were set to work to repair the losses sustained in the Caporetta disaster. The year 1919, the first under peace conditions, showed a wonderful revival with 43.5 million liras worth of exports, both the number and the value of the vehicles being higher than in 1914.

As the last figures available for the Italian industry only cover the first six months of 1920, the effect of the labor troubles during the fall of that year are not yet known. The year began well, and had the second half been as flourishing as the first half, Italy would have reached a record under peace conditions.

Italian Automobile Exports

from 1910 to 1920.

Year	Number of Trucks	Number of Pass. Cars	Value of Trucks Liras	Value of Pass. Cars, Liras
1910	166	2,120	1,873,500	20,806,070
1911	212	2,918	2,236,072	29,127,875
1912	309	3,647	2,929,580	35,786,180
1913	232	3,233	2,305,470	31,875,467
1914	362	3,291	4,037,325	36,634,670
1915	2,286	2,485	35,830,400	27,550,575
1916	5,639	842	74,663,100	9,369,151
1917	8,032	702	103,139,140	11,839,665
1918	1,867	1,071	28,557,500	16,784,900
1919	1,409	1,144	25,659,210	17,917,813
1920 for 6 months	Trucks and Pass. Cars	2,234	52,759,953	

Italy is the European nation having the greatest proportion of export to home business, and at the present time is sending probably 70 per cent of her output abroad. It has been declared that Italian manufacturers are obliged, under Government decree, to export 90 per cent of their production. This is not correct, for although a law to this effect was proposed, it was never put into operation.

Italian exports for the first half of 1920 were:

Italian Automobile Exports

from January 1 to June 30, 1920.

	No.	Value Liras
Automobiles weighing 1102 pounds	15	251,000
From 1102 to 2204 pounds:		
Belgium	85	
France	10	
England	227	
Spain	40	
Switzerland	197	
Australia	48	
Other Countries	189	15,276,749
From 2204 pounds and up:		
Belgium	73	
Denmark	24	
France	47	
England	395	
Norway	28	
Holland	55	
Spain	105	
Switzerland	111	
Turkey	36	
India and Ceylon	45	
Algeria	39	
Egypt	86	
Other Countries	379	37,232,204

Before the war Great Britain was Italy's best individual client, but France, Germany, Austria, Switzerland and the South American States were all big purchasers. No detailed official post-war statistics have been published which would show the changes that have taken place.

Italy, it is estimated, had 50,000 men directly engaged in the automobile industry in 1920, compared with 70,000 at the height of the war, and 10,000 in pre-war days. The productive capacity of the factories has therefore increased five times.

A REPORT made by the Red Sociedad Automovolistica Sevillana, of Seville, Spain, shows that the 1920 automotive registrations for that city alone were 877 passenger cars, 220 trucks and 30 motor buses. The three leading makes of cars were shown as of American manufacture.

Italian Automobile Exports by Countries for 1914 and 1915.

Country	1914 Cars Pass.	1914 Value Liras	1914 Trucks	1914 Value Liras	1915 Cars Pass.	1915 Value Liras	1915 Trucks	1915 Value Liras
Albania	1	16,000	....	.....	86	1,191,000	....	.....
Austria-Hungary	153	1,738,000	4	59,000	7	59,000	15	200,000
Belgium	17	226,500	....	.....	71	1,096,000	44	646,400
Bulgaria	9	119,000	....	.....	5	60,000	....	.....
Denmark	1	10,000	....	.....	4	50,000	....	.....
France	210	2,341,000	158	1,698,325	374	5,301,500	1515	24,333,500
Germany	389	4,486,000	22	242,000	90	1,034,000	25	237,500
Great Britain	985	9,297,000	68	830,000	684	6,139,425	238	3,044,000
Greece	73	1,061,800	11	127,000	31	341,800	25	400,000
Malta	4	41,000	....	.....	....	.....	....	.....
Montenegro	....	.....	2	24,000	....	.....	....	.....
Norway	16	163,000	....	.....	24	223,000	....	.....
Holland	41	382,000	16	192,000	21	174,000	....	.....
Portugal	22	303,000	3	36,000	8	85,250	72	1,119,000
Roumania	69	978,000	1	7,000	26	393,000	65	975,000
Russia	156	1,831,000	1	10,000	342	4,260,500	178	2,712,000
Serbia	7	127,000	....	.....	2	22,000	....	.....
Spain	36	948,000	5	56,000	51	464,000	44	661,000
Sweden	10	104,500	....	.....	7	64,000	....	.....
Switzerland	219	2,704,000	15	200,000	37	338,500	9	38,000
Turkey European	36	385,630	2	16,000	....	.....	....	.....
China	4	37,000	....	.....	....	.....	....	.....
Philippine	1	10,000	....	.....	....	.....	....	.....
Japan	38	473,000	....	.....	8	101,000	....	.....
British India and Ceylon	48	670,600	....	.....	84	761,000	30	520,000
Dutch Indies	68	713,050	....	.....	72	785,500	4	68,000
Siam	5	41,000	....	.....	3	36,000	1	18,000
Malacca	15	150,200	....	.....	13	134,000	....	.....
Turkey Asiatic	1	8,000	....	.....	....	.....	....	.....
Australia	157	1,400,700	3	46,000	194	1,708,750	18	270,000
New Zealand	2	20,000	....	.....	....	.....	....	.....
Spanish Africa	3	35,400	....	.....	....	.....	....	.....
Algeria	2	31,000	....	.....	....	.....	....	.....
Egypt	3	34,000	14	168,000	1	8,000	....	.....
Morocco	1	13,000	....	.....	2	24,000	....	.....
Argentina	131	1,636,400	6	100,000	35	403,000	....	.....
Brazil	35	423,490	6	110,000	12	148,000	....	.....
Chili	14	193,000	....	.....	2	15,000	1	20,000
Colombia	2	14,000	....	.....	4	66,000	....	.....
Cuba	12	145,000	....	.....	7	92,000	....	.....
Equator	1	10,000	....	.....	....	.....	....	.....
Mexico	10	263,000	1	22,000	....	.....	....	.....
Salvador	1	8,000	....	.....	1	12,000	....	.....
United States	217	2,570,000	....	.....	163	1,786,350	....	.....
Uruguay	6	81,800	....	.....	12	156,000	....	.....
Venezuela	2	20,000	....	.....	....	.....	....	.....
Istria	19	118,500	17	69,000	....	.....	....	.....
Tripoli	39	191,000	7	35,000	1	15,000	....	.....
Italian Somaliland	....	.....	....	.....	1	12,000	2	18,000
Total	3,261	33,465,570	362	4,047,325	2,485	27,560,575	2,286	35,280,400

Design Tendencies in 1921 British Passenger Car Chassis

Light car with 100 cu. in. or smaller engine increasingly popular due to lower tax and upkeep cost. Return to pump circulation predicted. Majority of new makes prefer cone clutch to plate type. Fewer four speed gearsets and transmission brakes. Use of spiral bevel increasing.

By M. W. Bourdon

THE accompanying tabulated specifications of British passenger cars gives clear evidence of the increasing popularity of the light two and four-passenger car with a four-cylinder engine of less than 100 cu. in. capacity. As will be seen, over twenty-five makers are producing these small chassis, and though the majority are made in plants with small outputs, the aggregate production is variously estimated at 500-750 per week. The average weight of the most popular examples is approximately 1400 lb. for the two-seaters and 1700 lb. for the light four-passenger models complete with bodywork. The wheelbase varies from 90 in. to 110 in., while the track varies from 44 to 56 in.

The table does not include cyclecars, of which—with three or four wheels and motorcycle type single or V twin engines, belt, chain or shaft transmission—there is an almost endless number of makes, the majority issuing from small plants, some with an output of but two or three chassis a week. But the table includes such well-known and popular makes as the 12-hp. A.B.C. and the 8-hp. Rover, both of which, despite their horizontally opposed twin-cylinder air-cooled engines, are recognized as light cars by reason of their controls, transmission and chassis being on lines generally adopted in larger types.

These light two or four-seaters are making a forcible appeal to British users by reason of their low cost of upkeep, economy in fuel and the smaller annual tax to which they are subject on the new scale of £1 (say $5) per horsepower, the latter calculated on the formula $\frac{D^2 N}{2.5}$, where dimensions are in inches and D equals diameter of cylinder bore and N the number of cylinders. The fact that stroke is not taken into consideration in the official formula has not led to any marked increase in piston speed, even in recently designed engines.

Stroke-bore ratios have not, in fact, increased in British cars of any size, popular sizes being usually in the neighborhood of 1.7 or 1.8 to 1. The longest stroke among British engines is 160 mm. (6⅛ in.), employed in the Sizaire-Berwick, which has a bore of 95 mm. (3¾ in.). But several makes have a stroke of 150 mm. (5⅞ in.), notably Sunbeam, Star and Vauxhall.

There have been one or two additions since 1919 to the list of "super-grade" chassis, the new Sheffield Simplex and the Leyland being prominent in this respect. The first mentioned is the first passenger car engine to have the Ricardo trunk piston, while the latter is the first British car with eight cylinders in line. Among more reasonably priced cars of recent design the 18-hp. Phœnix is noteworthy, for while it has an overhead camshaft and other features conducive to volumetric and general efficiency it is designed from a production standpoint, and among British chassis is considered in the forefront in this regard.

Dealing with design features generally, there has been a slight increase in the percentage of four-cylinder engines (76 as against 66); this is not due to any maker discarding the six but to an increase in the number making fours. Air cooling has made no headway during the year; in fact, except for cyclecars, it has receded, and no British car larger than the 12-hp. A.B.C. has other than water-cooled cylinders. Nor has there been any increase worthy of mention in the proportionate number of detachable head engines. They comprise 49 per cent of the whole number, 40 per cent of those with loose heads having the cylinder barrels cast as a unit with the upper half of the crankcase. In one or two instances (the H.E. is an example) the detachable head has the valve caps usually associated only with integral heads.

As regards valve arrangement, the L head cylinder predominates to even a greater extent than last year, some 72 per cent of engines being so equipped as compared with 62 per cent twelve months ago. Percentages indicate that valves-in-the-head engine has decreased in favor, for the table shows only 21.5 per cent of engines with overhead valves against 31 per cent last year. But actually, judged by the standard of cars produced, they have increased, for they are embodied in the designs of firms such as Wolseley and Standard, each with outputs exceeding the aggregate of those of a selected dozen or more of the smaller plants making L head engines. In the operation of overhead valves, the overhead camshaft is favored, viz., 57 per cent, as against 43 pushrods. With the latter all makers except one (Dawson) have rockers between cams and valve stems.

The T head engine has disappeared entirely from passenger car engines, but the pair-cast cylinder is still found in 4 per cent of four-cylinder motors, notably in one of the smallest of these, the 10-hp. Singer.

Aluminum pistons have made no headway, though they are found in 26 per cent of engines, the types in this material most generally favored being the Ricardo "slipper" design and the split skirt pattern, with an internal cast iron expansion ring close to the lower edge of the skirt. Both of these have almost an entire freedom from piston slap when cold. Only seven makers fit a scraper ring at the bottom of the skirt, but approximately 40 per cent arrange for the lowest of the compression rings to serve the same purpose, by beveling the lower edge of its slot and drilling small holes through at 45 deg. from bevel to interior with the inner end of the hole lower than the top.

In pre-war designs 90 per cent of wrist pins were fixed in the piston bosses, but at present only 52 per cent are thus secured, for there is a pronounced tendency either to follow American practice and fix the pin in the connecting rod or to allow it to float in both piston and rod. The latter arrangement is the most popular variation from hitherto standard practice, and 28 per cent of engines have floating wrist pins.

Hollow shaft (pressure) lubrication has not gained ground on a percentage basis, but in trough systems it is becoming increasingly prevalent to provide direct leads under pressure from the oil pump to the crankshaft main journals and frequently also to the camshaft bearings. Thus, while 51 per cent of British engines have trough lubrication for the big-ends, fully 50 per cent of these have direct leads to the crankshaft journals or camshaft bearings, if not to both. There is no pronounced tendency when the hollow shaft system is adopted to carry the oil up to the small end of the connecting rod, both this and the cylinder walls depending upon splash. Plunger oil pumps are not particularly favored by British engine designers. Only some 21 per cent have the oil circulated by this means. The twin pinion gear pump is by far the most popular. No attempt has been made by British passenger car makers to adopt a dry sump system of lubrication or to cool the oil by any means other than by longitudinal fins cast at the bottom of the crankcase sump.

In regard to fuel feed, the reason why the gravity system shows an advance in favor as compared with last year (56 per cent as against 48 per cent) is the increase in the number of small cars for which the vacuum system has not been considered necessary or desirable. Complaints have certainly been made against the vacuum feed on account of the occasional derangement of its mehanism, but criticism on this score has not had any effect in decreasing its number of adherents or preventing it from being adopted by makers previously favoring gravity or pressure systems. The desirability of making the vacuum tank larger and capable of being filled direct, so that the fuel can be fed by gravity therefrom when the mechanism fails, has not been seriously considered, and only one maker, namely, Sizaire Berwick, has a vacuum tank of other than normal size. In the case mentioned the tank is cylindrical and horizontal and holds 1½ Imperial gallons.

In water circulation systems there is discernible a slight tendency to return to the pump, but this inclination is only just commencing, and the thermo-syphon system still predominates. Forty-eight per cent of cars have thermo-syphon pure and simple, while 8 per cent are termed "assisted" thermo, having a belt driven water accelerator, usually at the rear end of the fan spindle, the rotor being located within the cylinder water jacket. This assisted thermo system is, however, coming to be recognized as a very poor substitute for the pump arrangement, where the pump is really efficient in serving its purpose and is provided with a direct mechanical drive.

Magneto ignition continues to hold its own, being standard on 94 per cent of makes, 5 per cent of which have a battery system in reserve. Battery systems alone are used on only 6 per cent of cars, and Wolseley, who specifies it, is still fitting magnetos. There are indications, however, that battery ignition will be found in increasing numbers before twelve months are past, if one may judge by hints thrown out by the two or three electrical firms who are standardizing an equipment of this type.

In connection with distribution gearing the silent chain is used in 55 per cent of cases, but in only half the number of these is any adjustment provided.

Turning to transmission details, the single plate or disk clutch is represented on only 27 per cent of cars as compared with 41 per cent last year, but here again this does not infer that it is falling into disfavor among those firms who have adopted it. Rather is it the case that the majority of new makers have preferred to use the cone type. There has been a slight falling off in the number of four-speed gearsets, for while twelve months ago these appeared on 59 per cent of cars, only 50 per cent have them at present.

The increasing use of fabric disks for universal joints is a pronounced tendency of British design. On open propeller shafts 28 per cent have disk joints at both ends, in some cases the flexibility of the disks being considered sufficient to warrant the elimination of a sliding joint to allow for variations in centers with spring deflection.

Metallic universals show improvement in increase of bearing area and lubrication. It is by no means infrequent to find the casings of such joints supplied with oil directly from the gearset or the back axle, while, where hand replenishment is called for, it is now rarely needed on account of better provision for retaining lubricant within the casings. When leather sleeves are used to prevent escape of oil between joint casing and shaft they are far more efficient in their purpose than hitherto.

As was expected, 1920 has shown a considerable accession to the ranks of those makers using spiral bevels for the final drive, and, as compared with only 33 per cent last year, 46 per cent now have spiral bevels in the rear axle; both straight bevels and worm have given way, the latter appearing in 9 per cent fewer cars than at the end of 1919.

Another pronounced tendency occurs in connection with brakes, for whereas before the war it was exceptional to find a British car with both sets applying to rear wheel drums, only 39 per cent now have a transmission brake; but rear wheel brakes, whether there be one set or two, are internally in 90 per cent of cars. The external band brake finds favor in only a few cases, though among these are the Daimler cars. The latter, however, have a transmission brake applied by lever, the band brake on the wheel drums being pedal operated.

In suspension systems the semi-elliptic spring is still predominant, though the quarter elliptic is increasing in favor for cars of all sizes and powers and seems likely to displace both semi-elliptics and cantilevers in popular priced jobs. The wood wheel is fast disappearing, its place being taken by the pressed-steel hollow-spoked variety and the single disk. The latter is standard on 20 per cent of cars as compared with 20 per cent wire spoked and 56 per cent pressed steel. Strangely enough the wire spoked variety is, generally speaking, used on only the cheapest and the most expensive cars. On the former it is, however, merely a laced spoke wheel on cycle lines, whereas for high-class cars the Rudge-Whitworth and Dunlop wheels are favored.

Eighty per cent of British cars have a belt drive for the electric generator, a fact which is by no means to the credit of British designers when one considers the advantages of direct drive and the ease with which it can be arranged.

While two-unit electric systems vastly predominate, the one-unit arrangement shows a slight increase in favor—mostly, however, in connection with engines up to 100 cu. in. in capacity.

Unlike American and Continental cars, only 25 per cent of British make have the unit system of engine and gearset. Four per cent and 3 per cent of gearests are on back axle and torque tube respectively, while 68 per cent are separately mounted. Sixty per cent of the latter are separate units in the main frame; sub-frames are used to carry both engine and gearset in 30 per cent of the remainder, while 10 per cent of separate gearsets have a sub-frame to themselves. Ball bearings are favored more than the roller type for both gearsets and back axles, though of gearset layshafts 70 per cent have plain bushes and the pilot bearing is also plain in an equal number.

British Passenger Car

Compiled for Automotive

Number	Name	Cylinder In.	Detachable Head	Cylinder Shape	Piston M't'r'l	S-Scraper Ring No. of Rings	Piston Pin Fixed in	Engine Lubrication System	Type of Oil Pump	Fuel Feed	Water Circulation	Number	Type of Radiator	Distribution Gear	Adjustment for Chain	Clutch
1	A.B.C.	2-3.6x3.6	Yes	I	C-I	3	Float	Circ	Plunger	Grav.	None	1		Gear		Disk
2	A.C.	4-2¾x3½	Yes	L	Al	3	Float	Pres	Plunger	Grav.	Ther	2	T.	Chain	Yes	Disk
3	A.C.	6-2⅞x3½	Yes	I	Al	3	Float	Pres	Plunger	Grav.	Pump	3	T.	Chain	Yes	Disk
4	Albert	4-2½x4	Yes	I	C-I	3		Pres		Grav.		4	H	Chain		Disk
5	Angus-Sanderson	4-3 x 5	Yes	L	C-I	3	Float	Pres	Plunger	Grav.	Ther	5	H	Gear		Cone
6	Argyll	4-3⅛x5½	Yes	K	C-I	3	Piston	Pres	Plunger	Vac	Pump	6	T.	Chain	No	Disk
7	Armstrong-Siddeley	6-3½x5¼	No	I	C-I	3	Float	Pres	Gear	Grav.	Pump	7	H	Chain	No	Multi
8	Arrol-Johnston	4-3½x4¾	No	L	C-I	3	Piston	Pres	Gear	Grav.	Ther	8	H	Chain	No	Disk
9	Austin	4-3¾x5	Yes	L	Al	3	Piston	Pres	Gear	Vac	Pump	9	H	Chain	Yes	Disk
10	Autocrat	4-2¾x4¾	Yes	L	CI-	3	Float	Spl	Plunger	Grav.	Ther	10	H	Gear		Multi
11	Bean	4-2¾x4¾	No	L	C-I	2 & S	Float	Pres	Gear	Grav.	Ther	11	H	Chain	Yes	Cone
12	Beardmore	4-2½x4½	Yes	I	C-I	3	Piston	Spl	Gear	Grav.	Ther	12	J	Gear		Disk
13	Beardmore	4-3½x4¾	Yes	L	C-I	3	Piston	Spl	Gear	Grav.	Ther	13	T.	Chain	No	Cone
14	Beardmore	4-3½x6⅛	No	L	St	3	Piston	Spl	Gear	Press.	Pump	14	T.	Gear		Cone
15	Belsize	4-3½x4⅛	No	L	C-I	3	Piston	Spl	Gear	Grav.	Pump	15	H			Cone
16	Bentley	4-3½x5⅞	No	I	Al	3	Float	Pres	Gear	Vac	Pump	16	H	Gear		Cone
17	Blackburn	4-3½x5	No	L	C-I	3		Pres	Plunger	Vac	Ther	17	H	Chain	No	Cone
18	Briton	4-2½x4⅛	No	L	C-I	3	Piston	Spl	Vane	Grav.	Ther	18	H	Gear		Disk
19	Briton	4-2⅛x4¾	No	L	C-I	3	Piston	Spl	Vane	Grav.	Ther	19	H	Gear		Cone
20	Calcott	4-2¾x4⅛	No	L	C-I	3	Float	Spl	Gear	Grav.	Ther	20	Hor. T.	Chain	Yes	Cone
21	Calthorpe	4-2⅛x3¾	No	L	Al	2	Rod	Spl	Plunger	Grav.	Ther	21	T.	Chain	No	Disk
22	Clement-Talbot	4-3½x5⅛	No	L	C-I	4	Piston	Pres	Gear	Press.	Pump	22	H	Gear		Cone
23	Clement-Talbot	4-4 x5½	No	L	C-I	4	Piston	Pres	Gear	Press	Pump	23	H	Gear		Cone
24	Cluley	4-2⅞x4⅛	No	L	C-I	2	Piston	Pres	Gear	Grav.	Ther	24	H	Gear		Cone
25	Crossley	4-3½x5⅞	Yes	L	C-I	3	Float	Pres	Gear	Vac	Pump	25	T.	Chain	Yes	Cone
26	Crossley	4-4 x5½	No	L	C-I	3 & S	Piston	Pres	Gear	Vac	Pump	26	T.	Chain	Yes	Cone
27	Charron-Laycock	4-2⅜x4⅛	Yes	L	C-I	3		Pres	Gear	Vac	Ther	27	H	Gear		Cone
28	Cubitt	4-3⅛x5½	Yes	L	C-I	3		Spl		Grav.		28				Cone
29	Daimler (light)	6-3½x5⅛	Yes	K	C-I	3	Rod	Spl	Multi	Press	Pump	29	H	Chain	No	Cone
30	Daimler (long)	6-3½x5⅛	Yes	K	C-I	3	Rod	Spl	Multi	Press	Pump	30	T.	Chain	No	Cone
31	Daimler	6-4⅛x5⅛	Yes	K	C-I	3	Rod	Spl	Multi	Press	Pump	31	T.	Chain	No	Cone
32	Dawson	4-2¾x4¾	Yes	I	Al	..		Spl	Gear	Grav.	Ther	32	H			Cone
33	Deemster	4-2⅛x3½	No	L	C-I	2	Piston	Spl	Gear	Grav.	Ther	33	T.	Gear		Cone
34	Douglas	2-3⅝x3⅝	No	L	C-I	2	Piston	Spl	Vane	Grav.	Ther	34	H	Chain	No	Cone
35	Duplex	4-2⅝x4⅛	No	L	C-I	2	Piston	Spl—	Gear	Grav.	Ther	35	H	Chain	Yes	Cone
36	Enfield-Allday	4-2½x4⅝	No	L	C-I	3	Piston	Pres	Gear	Vac	Ther	36	H	Chain	Yes	Cone
37	Ensign	6-4 x5½	I	Al	3 & S	Float	Pres	Gear	Pres	Pump	37	H	Worm			Multi
38	Galloway	4-2⅜x4⅛	Yes	L	C-I	3	Rod	Pres	Gear	Grav.	Pump	38	H	Gear		Cone
39	Guy	8-2⅛x4⅛	Yes	L	C-I	2	Float	Pres	Gear	Vac	Pump	39	T.	Chain	No	Cone
40	G.W.K.	4-2⅝x3⅛	Yes	L	C-I	3	Rod	Spl	Plunger	Grav.	Ther	40	T.	Gear		None
41	H.E.	4-2⅛x4¾	Yes	L	C-I	3	Rod	Spl	Gear	Vac	Ther	41	H	Chain	Yes	Multi
42	Hillman	4-2⅛x4¾	No	L	Al	3	Piston	Spl	Gear	Grav.	Ther	42	H	Gear		Cone
43	Humber	4-2⅛x4¾	Yes	L	C-I	2	Float	Spl	Gear	Grav.	Ther	43	H	Chain	No	Cone
44	Humber (long)	4-2⅛x4¾	Yes	L	C-I	2	Float	Spl	Gear	Grav.	Ther	44	H	Chain	No	Cone
45	Humber	4-3⅛x5½	No	L	Al	3	Float	Pres	Gear	Vac	Ther	45	H	Chain	No	Cone
46	Hortsmann	4-2⅜x3⅛	Yes	H	C-I	2	Rod	Spl	Plunger	Grav.	Ther	46	T.	Chain	Yes	Disk
47	Lagonda	4-2¾x3¾	No	S	Al	2	Piston	Spl	Plunger	Grav.	Ther	47	H	Chain	Yes	Cone
48	Lanchester	6-4 x5	No	I	Al	3 & S	Float	Pres	Gear	Vac	Pump	48	H	Gear		Disk
49	Leyland	8-3½x5½	Yes	I	Al	....					Pump	49	H			Disk
50	McKenzie	4-2⅝x4⅛	No	L	St	2	Piston	Pres	Gear	Grav.	Ther	50	H	Chain	Yes	Cone
51	Meteorlite	4-2⅝x4⅛	No	L	C-I	2	Piston	Pres	Gear	Grav.	Ther	51	H	Chain	Yes	Cone
52	Morris-Oxford	4-2¾x4	Yes	L	C-I	4	Rod	Spl	Plunger	Grav.	Ther	52	T.	Gear		Disk
53	Morris-Cowley	4-2¾x4	Yes	L	C-I	4	Rod	Spl	Plunger	Grav.	Ther	53	T.	Gear		Disk
54	Morris-Six	6-2¾x4	Yes	I	C-I	4	Rod	Spl	Plunger	Grav.	Ther	54	T.	Gear		Disk
55	Napier	6-4 x5	Yes	I	Al	3 & S	Piston	Pres	Gear	Pres	Pump†	55	H	Gear		Disk
56	Phoenix	4-2¾x3⅛	No	L	C-I	3	Piston	Spl	Gear	Grav.	Ther	56	T.	Gear		Disk
57	Phoenix	4-3⅜x5⅛	Yes	I	C-I	3	Rod	Spl	Gear	Vac	Pump	57	H	Gear		Cone
58	Riley	4-2⅝x4⅛	Yes	L	Al	3 & S	Piston	Pres	Gear	Grav.	Ther	58	H	Chain	No	Cone
59	Rolls-Royce	6-4½x4¾	No	L	Al	6	Piston*	Pres	Plunger	Pres	Pump	59	H	Gear		Cone
60	Rover	2-3⅝x3⅞	Yes	L	C-I	2	Rod	C-S	Vane	Grav.	None	60		Gear		Plate
61	Rover	4-2⅛x5⅛	Yes	L	C-I	3	Rod	Spl	Gear	Vac	Pump	61	H	Chain	No	Plate
62	Rubery-Lindsay	3-3 x3½	No	I	C-I	3	Float	Pres	Gear	Grav.	None	62		Gear		Cone
63	Ruston-Hornsby	4-3½x5⅛	Yes	L	C-I	2	Piston	Spl	Gear	Grav.	Pump	63	H	Gear		Cone
64	Ruston-Hornsby	4-3½x5⅛	No	L	C-I	2	Piston	Spl	Gear	Grav.	Pump	64	H	Gear		Cone
65	Ryner-Wilson	6-2⅛x4½	Yes	I	Al	..		Spl	Gear	Grav.	Ther	65	H	Gear		Cone
66	Sheffield-Simplex	6-4½x5	No	L	Al	4	Float	Pres	Gear	Pres	Pump	66	T.	Chain	Yes	Multi
67	Singer	4-2½x3⅞	No	L	C-I	3	Piston	Spl	Gear	Vac	Ther	67	T.	Gear		Cone
68	Sizaire-Berwick	4-3¾x6⅛	No	L	Al	4	Rod	Pres	Gear	Vac	Pump	68	H	Gear		Disk
69	Standard	4-2¼x4⅛	Yes	I	Al	3	Piston	Pres	Gear	Vac	Ther	69	T.	Chain	Yes	Disk
70	Star	4-3⅛x5⅞	No	L	C-I	2	Piston	Pres	Gear	Vac	Pump	70	H	Chain	No	Disk
71	Star	4-3¾x5⅞	No	L	C-I	3	Piston	Pres	Gear	Vac	Pump	71	H	Chain	No	Disk
72	Straker-Squire	6-3½x5⅛	No	I	Al	3 & S	Piston	Pres	Gear	Vac	Pump†	72	H	Gear		Disk
73	Sunbeam	4-3½x5⅞	No	L	C-I	4		Pres	Gear	Vac	Pump	73	H	Chain	No	Cone
74	Sunbeam	6-3½x5⅞	No	L	C-I	4		Pres	Gear	Vac	Pump	74	H	Chain	No	Cone
75	Swift	4-2½x3½	No	L	C-I	2	Piston	Pres	Gear	Grav.	Ther	75	T.	Chain	No	Cone
76	Swift	4-2¾x5⅞	No	L	C-I	3	Piston	Pres	Gear	Grav.	Ther	76	T.	Chain	Yes	Cone
77	Turner	4-2¾x4¾	No	L	C-I	3	Piston	Spl	Gear	Grav.	Ther	77	T.	Chain	Yes	Cone
78	Vauxhall	4-3¾x5½	No	L	C-I	3	Piston	Pres	Plunger	Pres	Ther	78	H	Chain	Yes	Multi
79	Vauxhall	4-3⅞x5⅞	No	L	Al	2	Float	Pres	Plunger	Pres	Ther	79	H	Chain	Yes	Multi
80	Vulcan	4-2¾x4¾	Yes	L	C-I	....		Spl		Grav.		80		Gear		Disk
81	Vulcan	4-3½x5½	Yes	L	C-I	2	Float	Spl	Gear	Vac	Pump	81	H	Gear		Cone
82	Vulcan	4-3½x5⅛	No	L	C-I	3	Float	Spl	Gear	Vac	Pump	82	H	Gear		Cone
83	Warren-Lambert	4-2⅝x3¾	No	L	C-I	3	Piston	Spl	Gear	Grav.	Ther	83	H	Gear		Cone
84	Waverly	4-3 x5	Yes	L	Al	2	Rod	Pres	Plunger	Grav.	Ther	84	H	Gear		Cone
85	Westwood	4-2¾x4¾	Yes	I	C-I	3	Piston	Pres	Plunger	Grav.	Ther	85	T.	Chain	Yes	Cone
86	Wolseley	4-2⅛x3¾	Yes	I	Al	2	Rod	Spl	Gear	Grav.	Ther	86	H	Chain	No	Multi
87	Wolseley	4-3½x5½	Yes	I	Al	3	Rod	Spl	Gear	Vac	Pump	87	H	Chain	No	Multi
88	Wolseley	6-3½x5½	No	L	Al	3	Rod	Spl	Gear	Vac	Pump	88	H	Chain	Yes	Multi

ABBREVIATIONS—Battery Ignition, 28, 49, 86, 87. Top half of crank case integral with cylinders, 5, 10, 28, 40, 43, 44, 46, 49, 52, 53, 54, 55, 57, 63, 81, 84, 85, 86. Overhead camshafts, 3, 12, 16, 32, 37, 48, 49, 55, 57, 72, 86, 87. Tappet rods at side of cylinders, 1, 4, 7, 46, 54, 62, 65, 69, 85 cylinders cast in pairs, 17, 67; **Cylinder Shape**—L—L Head; I—I Head; K—Knight engine; H—Horizontal in side valves; S—Superimposed valves. **Piston Material**—C. I.—Cast Iron; Al—Aluminum; St—Steel; †—Cast Iron in skirt. *Floating box in conn. rod.

Chassis Specifications.

Industries by M. W. Bourdon.

Gearset Mounting	No. of Gears	Gear Lever Position	Propeller Shaft	Propeller Shafts Universal Joints		Final Drive	Rear Axle Ratio — to 1	Pedal Brake		Hand Brake		Springs		Weight of Chassis lb.	Wheelbase	Track	Wheels
				Front	Back			Position	Type	Position	Type	Front	Rear				
Amid	4	C	Encl	Disk		Sp. B	4.5	Wh	Ext	Wh	Int	¼-E	¼-E	950	102	47	P-Stl
Unit-A	3	R	Encl	Block		Worm	4.5	Wh	Int	Trans	Disk	¼-E	¼-E	1400	106	46	Disk
Unit-A	3	R	Encl	Block		Worm	4.5	Wh	Int	Trans	Disk	¼-E	¼-E	1600	106	46	Disk
Amid	4	C	Encl	Star		Sp. B	4					Semi	Cant	....	....	....	P-Stl
Unit-E	3	R	Encl	Star		Sp. B	4.2	Wh	Int	Wh	Int	Semi	Cant	1900	120	52	Optl
Unit-E	4	R	Encl	Star		Sp. B	4.3	Wh	Int	Wh	Int	Semi	Cant	2250	120	53	Disk
Unit-S	3	C	Encl	Star†		Worm	3.69	Wh	Int	Wh	Int	Semi	Cant	....	135	56	Disk
Unit-E	4	R	Encl	Star		Sp. B	4	Wh	Int	Wh	Int	Semi	¾	2180	120	56	Disk
Unit-E	4	C	Open	Block	Block	Sp. B	3.93	Wh	Int	Wh	Int	Semi	Semi	2250	129	56	Wood
Amid	3	R	Encl	Star		Sp. B	4.25	Wh	Int	Wh	Int	Semi	Semi	1680	112	48	P-Stl
Amid	3	R	Open	Star	Block	Sp. B	4	Wh	Int	Wh	Int	Semi	Semi	1450	102	49	P-Stl
Unit-E	4	C	Open	Block	Block	Sp. B	4.15	Wh	Int	Wh	Int	Semi	Semi	1230	105	50	P-Stl
Amid	4	R	Open	Disk	Disk	Sp. B	....	Trans	Ext	Wh	Int	Semi	Semi	2020	104	54	Wood†
Amid	4	R	Encl	Block		Sp. B	3.43	Wh	Int	Trans	Ext	Semi	Semi	2460	129	54	Wire
Unit-E	4	R	Open	Disk	Disk	Bev						Semi	Semi	....	116	56	P-Stl
Amid	4	R	Open	Star	Block	Bev	3.5	Wh	Int	Wh	Int	Semi	Semi	....	118	56	Wire
Amid	4	R	Encl	Star		Sp. B	3.06	Wh	Int	Wh	Int	Semi	Cant	....	126	56	P-Stl
Unit-E	3	C	Open	Disk	Disk	Worm	4.4	Trans	Ext	Wh	Int	Semi	Semi	....	98	46	P-Stl
Amid	3	C	Open	Disk	Disk	Bev	4.4	Trans	Ext	Wh	Int	Semi	Semi	....	109	53	P-Stl
Amid	3	R	Open	Disk	Disk	Bev	4	Wh	Int	Wh	Int	Semi	Semi	1400	102	45	P-Stl
Amid	3	R	Open	Disk	Disk	Sp. B	4.3	Wh	Int	Trans	Int	Semi	Semi	1000	99	44	Disk
Amid	4	R	Encl	Star		Sp. B	4.3	Wh	Int	Wh	Int	Semi	Semi	2575	121	52	P-Stl
Amid	4	R	Encl	Star		Sp. B	3.6	Wh	Int	Wh	Int	Semi	Semi	3025	133	56	P-Stl
Unit-E	3	C	Open	Block	Disk	Bev	4.3	Wh	Int	Wh	Int	Semi	Semi	1350	96	45	P-Stl
Amid	4	R	Open	Star	Block	Sp. B	3.57	Trans	Ext	Wh	Int	Semi	Semi	2070	124	55	P-Stl
Amid	4	R	Encl	Star		Sp. B	4	Trans	Int	Wh	Int	Semi	¾	....	135	54	Wire
Amid	3	R	Open	Disk	Disk	Sp. B	4.5	Wh	Int	Wh	Int	Semi	Semi	....	98	45	P-Stl
.....	4	C				Worm	....					Semi	Semi	....	126	54	Disk
Amid	4	R	Open	Star†	Star†	Worm	3.5	Wh	Ext	Trans	Ext	Semi	¾	2900	128	56	Wire
Amid	4	R	Open	Block	Star†	Worm	3.8	Wh	Ext	Trans	Ext	Semi	¾	3100	141	56	Wire
Amid	4	R	Open	Block	Star†	Worm	3.8	Wh	Ext	Trans	Ext	Semi	¾	3400	146	56	Wire
Amid	3	R				Sp. B	4					Semi	Semi	....	105	51	P-Stl
Amid	3	R	Encl	Star		Bev	4.5	Wh	Int	Wh	Ext	Semi	¼	1120	91	46	P-Stl
Unit-E	3	R	Encl	Disk		Bev	4.6	Wh	Ext	Wh	Int	Semi	Coil	....	96	48	Optl
Amid	3	C	Encl	Disk		Sp. B	4.6	Wh	Int	Wh	Int	¼	¼	1240	106	48	Disk
Amid	3	C	Encl	Star		Sp. B	4.75	Wh	Int	Trans	Int	Semi	Cant	1120	108	48	P-Stl
Unit-E	3	R	Semi	Star	Star	Sp. B	3.9	Wh	Int	Wh	Int	Semi	Cant	3360	148	56	P-Stl
Unit-E	3	C	Semi	Disk	Disk	Bev	4.2	Wh	Int	Wh	Int	Semi	¼	....	102	49	D
Amid	4	R	Open	Star	Block	Sp. B	4.06	Wh	Int	Wh	Int	Semi	Semi	2800	130	56	Wire
Amid	†	R	Open	Disk	Disk	Int-P	4.25	Wh	Int	Wh	Int	¼	¼	1130	106	48	Wire
Amid	4	R	Encl	Star		Worm	4.2	Wh	Int	Wh	Int	Semi	¾	1960	114	50	P-Stl
Amid	3	C	Open	Star	Star	Worm	4.2	Wh	Int	Wh	Int	Semi	Semi	1460	108	48	P-Stl
Unit-E	4	R	Open	Disk	Block	Bev	4	Trans	Ext	Wh	Ext	Semi	Semi	1100	98	49	P-Stl
Unit-E	4	R	Open	Disk	Block	Bev	4.3	Trans	Ext	Wh	Ext	Semi	Semi	1230	106	55	P-Stl
Amid	4	R	Open	Disk	Block	Bev	4.3	Trans	Ext	Wh	Ext	Semi	Semi	1750	123	57	P-Stl
Unit-A	3	R	Encl	Disk		Bev	4	Wh	Ext	Wh	Int	Cant	Cant	950	112	48	Disk
Unit-E	3	C	Encl	Star		Worm	4.5	Trans	Ext	Wh	Int	Trans	¼	1250	108	46	P-Stl
Unit-E	3	R	Encl	Star†		Worm	Optl	Trans	Int	Wh	Int	Semi	Cant	3130	140	58	Wire
Amid	4					Bev	....										
Amid	3	R	Open	Disk	Disk	Worm	4.1	Wh	Int	Wh	Int	Semi	Semi	1240	102	48	P-Stl
Amid	3	C	Encl	Star	Block	Bev	4.5	Wh	Int	Wh	Int	Semi	Cant	1200	105	50	P-Stl
Unit-E	3	C	Encl	Star		Sp. B	4.75	Wh	Int	Wh	Int	Semi	¾	1200	102	48	P-Stl
Unit-E	3	C	Encl	Star		Sp. B	4.75	Wh	Int	Wh	Int	Semi	¾	1200	102	48	P-Stl
Unit-E	3	C	Encl	Star		Sp. B	4.75	Wh	Int	Wh	Int	Semi	¾	1300	102	48	P-Stl
Amid	4	C	Encl	Star	Block	Sp. B	3.3	Trans	Ext	Wh	Int	Semi	Cant	2700	138	56	Wire
Amid	3	R	Encl	Star		Worm	4.1					Semi	Semi	1620	96	50	P-Stl
Unit-E	3	C	Encl	Star		Sp. B	4.2	Wh	Int	Wh	Int	Semi	Cant	....	126	56	P-Stl
Amid	4	C	Open	Disk	Disk	Bev	4.3	Wh	Int	Wh	Int	Semi	Semi	1120	108	48	Disk
Amid	4	R	Encl	Star		Bev	3.25	Wh	Int	Wh	Int	Semi	Cant	3000	144	56	Wire
Unit-E	3	C	Open	Disk	Block	Worm	4.8	Wh	Int	Wh	Int	¼	¼	700	88	46	Disk
Amid	3	R	Open	Star	Block	Worm	4.6	Trans	Ext	Wh	Int	Semi	Semi	1680	116	50	P-Stl
Amid	3	R	Encl	Star		Bev	4.5	Wh	Int	Wh	Int	¼	¼	850	100	48	Disk
Unit-A	3	C	Encl	Disk		Sp. B	4.25	Wh	Int	Wh	Int	Semi	¾	2250	117	56	P-Stl
Unit-A	3	C	Encl	Disk		Sp. B	4.25	Wh	Int	Wh	Int	Semi	¾	2350	126	56	Disk
Amid	4	C	Encl	Star		Bev	4.7	Wh	Int	Wh	Int	Semi	Cant	.....	123	56	Optl
Unit-S	4	R	Encl	Star		Sp. B	....	Wh	Int	Wh	Int	Semi	Cant	2800	150	56	Wire
Amid	3	R	Encl	Disk		Bev	4.3	Wh	Int	Wh	Int	Semi	Semi	1100	90	42	P-Stl
Amid	4	R	Open	Star†	Star†	Sp. B	4	Wh	Int	Trans	Int	Semi	Semi	....	141	57	Wire
Amid	3	R	Open	Disk	Disk	Worm	3.83	Trans	Ext	Wh	Int	Semi	Semi	1300	108	48	P-Stl
Amid	4	R	Open	Block	Block	Sp. B	3.9	Trans	Ext	Wh	Int	Semi	¾	2300	129	57	P-Stl
Amid	4	R	Open	Block	Block	Sp. B	3.9	Trans	Ext	Wh	Int	Semi	¾	2400	129	57	P-Stl
Amid	4	R	Encl	Star		Sp. B	4.15	Wh	Int	Wh	Int	Semi	Cant	1900	127	56	Wire
Amid	4	R	Open	Star	Block	Sp. B	3.59	Trans	Int	Wh	Int	Semi	Semi	....	124	57	P-Stl
Amid	4	R	Open	Star	Block	Sp. B	3.6	Trans	Int	Wh	Int	Semi	Semi	....	137	57	P-Stl
Amid	3	R	Open	Disk	Block	Bev	4.5	Trans	Ext	Wh	Int	Semi	Semi	1230	90	45	P-Stl
Amid	4	R	Open	Star	Block	Bev	4.26	Trans	Ext	Wh	Int	Semi	Semi	1570	108	48	P-Stl
Amid	4	R	Open	Disk	Disk	Worm	5	Wh	Int	Wh	Int	Semi	Semi	1570	108	51	P-Stl
Amid	4	R	Open	Star	Block	Sp. B	3.6	Trans	Int	Wh	Int	Semi	Semi	2900	130	56	Wire
Amid	4	R	Open	Star	Block	Bev	3	Trans	Int	Wh	Int	Semi	Semi	2650	114	54	Wire
Amid	4	C				Bev	4					Semi	Cant	....	108	48	
Amid	4	R	Open	Star	Block	Worm	4	Trans	Ext	Wh	Int	Semi	Semi	....	123	56	Wood
Amid	4	C	Open	Star	Block	Worm	4	Trans	Ext	Wh	Int	Semi	Semi	....	123	56	Wood
Unit-S	3	R	Encl	Disk		Bev	4.3	Wh	Int	Wh	Int	Semi	¼	950	93	44	Disk
Amid	3	R	Open	Disk	Disk	Sp. B	4.26	Wh	Int	Wh	Int	Semi	Dual-¼	1700	120	50	Disk
Amid	3	R	Open	Disk	Disk	Sp. B	4	Wh	Int	Wh	Int	Semi	Semi	1800	111	49	P-Stl
Unit-A	3	R	Semi	Disk	Block	Worm	5.2	Wh	Int	Wh	Int	¼	¼	1000	99	46	P-Stl
Amid	3	R	Semi	Disk	Block	Worm	4.8	Wh	Int	Wh	Int	¼	¼	1800	118	52	P-Stl
Amid	4	R	Open	Star	Block	Worm	4.6	Trans	Ext	Wh	Int	Semi	Cant	2460	138	54	Wire

Engine Lubrication—Circ—Circulating; **Pres**—Pressure; **Spl**—Splash; **C-S**—Circulating Splash. **Water Circulation—†**—Thermostatic Control. **Type of Radiator—T**—Tube; **H**—Honeycomb. **Gear Set Mounting—Amid**—Amidships; **Unit A**—Unit with Axle; **Unit E**—Unit with Engine; **Unit S**—Unit with Shaft. **Number of Gears—†**—Friction Disks. **Wheels—P-Stl**—Pressed Steel; *****—Demountable Rims.

Non-Ferrous Metal Specifications

(Excerpts from Report of S. A. E. Standard Committee)

WHITE BEARING METALS

Specification No. 10, Babbitt

Composition in percentage:

Tin	90.00 to 92.00
Copper	4.00 to 5.00
Antimony	4.00 to 5.00
Lead, max.	0.35
Iron, max.	0.08
Arsenic, max.	0.10
Bismuth, max.	0.08
Zinc	None
Aluminum	None

This analysis applies to the metal in the ingot form. When finished bearings are purchased a maximum of 0.6 per cent lead is permissible in scraped samples provided a lead-tin solder has been used in bonding the bronze and the babbitt.

General Information

This babbitt is very fluid and may be used for bronze-backed bearings, particularly for thin linings such as are used in aircraft engines. It is also suitable for die castings.

Specification No. 13, Babbitt

Composition in percentage:

Tin	4.50 to 5.50
Antimony	9.25 to 10.75
Copper, max.	0.50
Lead	84.00 to 86.00
Arsenic, max.	0.20
Zinc	None
Aluminum	None

General Information

This is a cheap babbitt and serves successfully where the bearings are large and the service light. It should not be used as a substitute for a babbitt with a high tin content. It is also suitable for die castings.

ALUMINUM ALLOYS

Specification No. 30

Composition in percentage:

Aluminum, min.	90.00
Copper	7.00 to 8.50
Zinc, max.	0.20
Silicon, Iron, Zinc, Manganese and Tin, max.	1.70
Other Impurities.	None

General Information

The tensile strength of test-specimens about ½-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 18,000 to 20,000 lb. per sq. in. and the elongation 1 to 2 per cent in 2 in.

This is a light alloy having a specific gravity of about 2.83 and is used more extensively in the automotive industry than all other light casting alloys combined. A shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs. This alloy is used for crankcases, oil-pans, steering-wheel spiders, differential carriers, transmission cases, camshaft housings, hub-caps and similar parts.

Specification No. 31

Composition in percentage:

Aluminum, min.	81.00
Copper	2.25 to 3.25
Zinc	12.50 to 14.50
Silicon, Iron, Manganese and Tin, max.	1.70
Other Impurities.	None

(*Continued on page* 327)

Specifications of Contin

(Compiled for Automotive Industries

Nationality and Make	Wheelbase (In.)	Track (In.)	No. of Cylinders	Valve Location	Cylinder Head	BORE AND STROKE Mm.	BORE AND STROKE In.	BORE AND STROKE Ratio	Piston Displacement (Cu. In.)	Camshaft Location	H.P. (Nominal)	Water Cooling	Lubricating System
BELGIAN													
Belga	110	49	4	L.	Fix.	65x120	2.56x4.73	1.8	97	C'case.	10	Ther.	Pres.
D'Aoust	106	49	4	L.	Fix.	65x140	2.56x5.52	2.1	113	C'case.	10	Ther.	Pres.
D'Aoust	126	55	4	I.	Det.	89x120	3.50x4.73	1.4	182	Head	15	Pump.	Pres.
Excelsior	150	56	6	L.	Fix.	85x140	3.35x5.52	1.6	291	C'case.	30	Ther.	Pres.
F. N.	135	55	4	L.	Fix.	90x150	3.54x5.91	1.6	231	C'case.	20	Pump.	Pres.
Metallurgique	146	56	4	L.	Fix.	100x160	3.94x6.30	1.6	305	C'case.	26	Pump.	Pres.
Metallurgique	137	56	4	L.	Fix.	90x140	3.54x5.52	1.5	216	C'case.	18	Pump.	Pres.
Metallurgique	126	52	4	L.	Fix.	80x130	3.15x5.12	1.6	160	C'case.	14	Ther.	Pres.
Miesse	126	56	4	I.	Det.	65x140	2.56x5.52	2.1	113	Head	15	Pump.	Pres.
Miesse	140	56	8	I.	Det.	65x140	2.56x5.52	2.1	113	Head	30	Pump.	Pres.
Minerva	137	56	4	Sl.	Det.	90x140	3.54x5.52	1.5	216	C'case.	20	Pump.	Pres.
Minerva	145	56	6	Sl.	Det.	90x140	3.54x5.52	1.5	324	C'case.	30	Pump.	Pres.
Nagant	137	55	4	L.	Fix.	80x150	3.15x5.91	1.8	184	C'case.	15	Pump.	Pres.
DUTCH													
Spyker	137	57	6	L.	Det.	95x135	3.74x5.32	1.4	351	C'case.	25	Pump.	Pres.
FRENCH													
Alba	114	49	4	L.	Fix.	65x130	2.56x5.12	2	105	C'case.	9	Ther.	Pres.
Aries	118	56	4	L.	Fix.	80x140	3.15x5.52	1.7	172	C'case.	15	Pump.	Pres.
Beck	105	52	4	I.	Det.	65x113	2.56x4.45	1.7	91	Head	10	Pump.	Pres.
Bellanger	103	57	4	I.	Fix.	90x125	3.54x4.92	1.3	193	C'case.	17	Pump.	Pres.
Bellanger	147	57	8	I.	Fix.	90x125	3.54x4.92	1.3	386	C'case.	50	Pump.	Pres.
Bellanger	114	56	4	L.	Det.	88x127	3.46x5.00	1.4	188	C'case.	15	Ther.	Circ.
Belleville	133	53	6	L.	Int.	78x140	3.07x5.52	1.8	245	C'case.	16	Pump.	Pres.
Belleville	142	55	6	L.	Int.	88x150	3.46x5.91	1.7	333	C'case.	25	Pump.	Pres.
Belleville	155	56	6	L.	Int.	103x160	4.06x6.30	1.5	488	C'case.	50	Pump.	Pres.
Berliet	123	56	4	L.	Det.	90x130	3.54x5.12	1.4	200	C'case.	16	Pump.	Circ.
Bignan	112	52	4	L.	Fix.	92x130	3.62x5.12	1.4	210	C'case.	18	Pump.	Pres.
Bollee, Leon	125	54	4	L.	Int.	85x130	3.35x5.12	1.5	179	C'case.	15	Ther.	Pres.
Bollee, Leon	128	55	6	L.	Int.	83x110	3.27x4.33	1.3	159	C'case.	18	Ther.	Pres.
Brasier	129	55	4	L.	Int.	85x150	3.35x5.91	1.7	207	C'case.	18	Pump.	Pres.
Brasier	143	56	6	L.	Int.	90x140	3.54x5.52	1.5	325	C'case.	24	Pump.	Pres.
Buchet	92	48	4	L.	Fix.	60x100	2.36x3.94	1.6	68	.....	6	Ther.	Pres.
Buchet	105	48	4	L.	Fix.	65x110	2.56x4.33	1.7	89	.....	8	Ther.	Pres.
Bugatti	95	44	4	I.	Int.	65x100	2.56x3.94	1.5	81	Head	6	Pump.	Pres.
Charron	90	41	4	L.	Fix.	58x100	2.28x3.94	1.7	64	C'case.	6	Ther.	Circ.
Charron	134	56	4	L.	Fix.	85x150	3.35x5.91	1.7	208	C'case.	15	Pump.	Circ.
Charron	132	55	4	L.	Det.	82x142	3.23x5.60	1.7	183	C'case.	18	Pump.	Pres.
Chenard-Walcker	112	52	4	L.	Fix.	70x130	2.75x5.12	1.8	120	C'case.	10	Ther.	Pres.
Chenard-Walcker	130	55	4	L.	Fix.	80x150	3.15x5.91	1.8	184	C'case.	15	Ther.	Pres.
Chenard-Walcker	120	55	4	L.	Fix.	75x150	2.95x5.91	2	161	C'case.	12	Ther.	Pres.
Citroen	114	48	4	L.	Det.	65x100	2.56x3.94	1.5	81	C'case.	10	Ther.	Pres.
Clayette	125	56	4	L.	Int.	85x140	3.35x5.52	1.6	193	C'case.	14	Pump.	Pres.
Clayette	138	56	6	L.	Int.	85x140	3.35x5.52	1.6	290	C'case.	18	Pump.	Pres.
Clement-Bayard	95	45	4	L.	Fix.	60x100	2.36x3.94	1.6	68	C'case.	10	Ther.	Pres.
Clement-Bayard	102	55	4	L.	Det.	85x115	3.35x4.53	1.3	160	C'case.	14	Ther.	Pres.
Corre	102	49	4	L.	Fix.	60x110	2.36x4.33	1.8	75	C'case.	10	Ther.	Pres.
Cottin-Desgouttes	133	55	4	L.	Int.	80x160	3.15x6.30	2	196	C'case.	14	Pump.	Pres.
Cottin-Desgouttes	133	55	4	L.	Int.	90x160	3.54x6.30	1.7	247	C'case.	18	Pump.	Pres.
Cottin-Desgouttes	133	55	4	L.	Int.	100x160	3.94x6.30	1.6	305	C'case.	23	Pump.	Pres.
Cottin-Desgouttes	141	55	4	L.	Int.	120x160	4.73x6.30	1.3	440	C'case.	32	Pump.	Pres.
Crespelle	135	55	4	L.	Fix.	80x120	3.15x4.73	1.5	147	C'case.	14	Pump.	Circ.
Dion Bouton	114	48	4	L.	Int.	70x120	2.75x4.73	1.7	111	C'case.	12	Pump.	Pres.
Dion Bouton	133	52	8	L.	Int.	70x120	2.75x4.73	1.7	222	C'case.	20	Pump.	Pres.
Delage	135	56	6	L.	Int.	80x150	3.15x5.91	1.8	276	C'case.	25	Pump.	Pres.
Delage	135	56	6	I.	Int.	80x150	3.15x5.91	1.8	276	C'case.	.....	Pump.	Pres.
Delage	135	56	4	L.	Int.	80x150	3.15x5.91	1.8	184	C'case.	16	Pump.	Pres.
Delahaye	126	54	4	L.	Det.	85x130	3.35x5.12	1.5	179	C'case.	18	Pump.	Circ.
Delahaye	137	56	6	L.	Det.	85x120	3.35x4.73	1.5	248	C'case.	22	Pump.	Circ.
Darracq	138	54	8	L.	Det.	75x130	2.95x5.12	1.7	278	C'case.	20	Pump.	Pres.
Darracq	124	51	4	L.	Det.	85x130	3.35x5.12	1.5	179	C'case.	14	Pump.	Pres.
Delaugere	116	56	4	L.	Int.	70x140	2.75x5.52	2	131	C'case.	10	Pump.	Pres.
Delaunay	117	52	4	L.	Int.	85x140	3.35x5.52	1.5	193	C'case.	12	Pump.	Pres.
Delaunay	133	53	4	L.	Int.	100x140	3.94x5.52	1.4	267	C'case.	18	Pump.	Pres.
Doriot Flandrin	94	50	4	L.	Int.	70x130	2.75x5.12	1.8	122	C'case.	12	Pump.	Circ.
Farman	142	56	6	I.	Int.	100x140	3.94x5.52	1.4	401	C'case.	40	Pump.	Pres.
Fonck	122	55	4	I.	Det.	80x130	3.15x5.12	1.6	160	Head	15	Pump.	Pres.
Fonck	143	55	8	I.	Det.	80x130	3.15x5.12	1.6	318	Head	30	Pump.	Pres.
Gregoire	118	51	4	I.	Det.	75x130	2.95x5.12	1.7	139	Head	15	Pump.	Pres.
Gamma	108	51	4	L.	Fix.	65x120	2.56x4.73	1.8	97	C'case.	10	Ther.	Circ.
G. N.	95	41	2	L.	Fix.	84x 98	3.31x3.86	1.1	66	C'case.	6	Air.	Splash.
Hispano	145	56	6	I.	Int.	100x140	3.94x5.52	1.4	401	Head	40	Pump.	Pres.
Hotchkiss	130	56	4	L.	Int.	95x140	3.74x5.52	1.4	242	C'case.	18	Pump.	Pres.
Hurtu	107	49	4	L.	Fix.	75x120	2.95x4.73	1.6	129	C'case.	12	Ther.	Pres.
Hurtu	118	51	4	L.	Fix.	76x130	2.99x5.12	1.7	144	C'case.	14	Ther.	Pres.
La Buire	117	52	4	L.	Fix.	75x150	2.95x5.91	2	161	C'case.	12	Pump.	Pres.
Lorraine-Dietrich	114	56	6	I.	Fix.	75x130	2.95x5.12	1.7	209	C'case.	15	Pump.	Pres.
Lorraine-Dietrich	131	56	6	L.	Fix.	90x160	3.54x6.30	1.7	370	C'case.	30	Pump.	Pres.
Majola	91	40	4	I.	Int.	59x 90	2.32x3.54	1.5	59	Head	12	Ther.	Pres.
Majola	110	40	4	I.	Int.	65x105	2.56x4.13	1.6	84	Head	20	Ther.	Pres.
M. J.	114	56	4	I.	Int.	66x100	2.60x3.94	1.5	83	C'case.	12	Ther.	Pres.
Mathis	86	42	4	L.	Int.	58x100	2.28x3.94	1.7	64	C'case.	8	Ther.	Circ.
Mathis	94	43	4	L.	Int.	60x100	2.36x3.94	1.6	68	C'case.	10	Ther.	Pres.
Mors	125	54	4	Sl.	Det.	90x130	3.54x5.12	1.4	200	C'case.	15	Pump.	Circ.
Motobloc	128	52	4	L.	Fix.	80x120	3.15x4.73	1.5	147	C'case.	12	Pump.	Pres.
Motobloc	128	52	4	L.	Fix.	80x148	3.15x5.83	1.8	181	C'case.	15	Pump.	Pres.
Panhard	114	56	4	L.	Fix.	72x140	2.83x5.52	1.9	139	C'case.	12	Pump.	Circ.
Panhard	129	56	4	Sl.	Det.	85x140	3.35x5.52	1.6	193	C'case.	16	Pump.	Circ.
Panhard	136	56	4	Sl.	Det.	105x140	4.13x5.52	1.3	296	C'case.	20	Pump.	Circ.
Paquis	100	47	4	L.	Fix.	65x120	2.56x4.73	1.8	97	C'case.	10	Ther.	Circ.
Peugeot	90	36	4	L.	Fix.	50x 85	1.98x3.35	.....	39	C'case.	8	Ther.	Pres.
Peugeot	98	47	4	L.	Fix.	66x105	2.60x4.13	1.6	88	C'case.	10	Pump.	Pres.
Peugeot	122	54	4	L.	Fix.	82x130	3.23x5.12	1.5	167	C'case.	14	Pump.	Pres.
Peugeot	144	57	6	Sl.	Fix.	95x140	3.74x5.52	1.4	424	C'case.	25	Pump.	Pres.
Philos	117	49	4	L.	Fix.	65x120	2.56x4.73	1.8	97	C'case.	10	Ther.	Pres.
Pilain	120	52	4	L.	Fix.	65x130	2.56x5.12	2	105	C'case.	10	Ther.	Pres.

ABBREVIATIONS: Valve Location; L. both valves on one side in L, I. valves in head, Sl. sleeve valve. **Lubricating System;** Pres. pressure feed to main and connecting rod bearings. Circ. pump with pressure delivery to main bearings only (shaft not drilled). **Starting and Lighting;** West. Westinghouse. **Clutch;** Disk, multiple disk, Plate, one to three plates. **Gearset Location;** Amid-amidship, Unit, unit mounting with engine. **Position of Levers;** R, right; L, left; C, center. **Final**

ental Passenger Car Chassis

by W. F. Bradley)

Carbureter Make	Fuel Feed	Ignition	Starting and Lighting	Clutch	Speeds	Gearset Location	Position of Levers	Final Drive	Tires (Mm.)	Wheels	Rear Springs	Brake Location
Solex	Grav.	Mag.	2-Unit	Cone.	8	None	R.	Bev.	815x105	Disk	½-El.	R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Bev.	760x 90	Wire	½-El.	Tr.-R.
Zenith	Vac.	2 Mag.	2-Unit	Disk	4	Unit	R.	Bev.	880x120	Wire	½-El.	F.-R.
2 Claudel	Vac.	Mag.	West	Cone.	4	Amid.	C.	Sp. Bev.	895x135	Wire	Cant.	F.-R.
Zenith	Pres.	Mag.	2-Unit	Disk	4	Unit	R.	Sp. Bev.	895x150	Wood	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Plate	4	Unit	C.	Sp. Bev.	895x135	Wire	½-El.	F.-Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	880x120	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	820x120	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	3	Unit	C.	Sp. Bev.	815x105	Wood	½-El.	R.
Zenith	Vac.	Mag.	2-Unit	Disk	3	Unit	C.	Sp. Bev.	895x135	Wood	½-El.	F.-Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Bev.	820x120	Wood	½-El.	Tr.-R.
Own	Pres.	Mag.	2-Unit	Disk	4	Unit	R.	Sp. Bev.	895x135	Wire	½-El.	Tr.-R.
Zenith	Grav.	Mag.	2-Unit	Cone.	3	Amid.	R.	Bev.	760x 90	Wood	¼-El.	F.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	R.	Bev.	820x120	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	3	Unit	C.	Bev.	765x105	Disk	Coil	Tr.-R.
Zenith	Pres.	Bat.	2-Unit	Disk	3	Unit	C.	Sp. Bev.	810x190	Wood	Cant.	F.-Tr.-R.
Zenith	Pres.	Bat.	2-Unit	Disk	3	Unit	C.	Sp. Bev.	935x135	Steel	Cant.	F.-Tr.-R.
Jackson	Grav.	Bat.	2-Unit West	Disk	3	Unit	C.	Sp. Bev.	820x105	Wood	½-El.	R.
Own	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Plat.	Tr.-R.
Own	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Plat.	Tr.-R.
Own	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	935x135	Wire	Plat.	Tr.-R.
Own	Vac.	Mag.	1-Unit	Disk	3	Unit	C.	Sp. Bev.	820x120	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	820x120	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Amid.	R.	Bev.	815x105	Detach.	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Amid.	R.	Bev.	880x120	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Amid.	R.	Sp. Bev.	880x120	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Amid.	R.	Sp. Bev.	895x135	Wire	½-El.	Tr.-R.
Solex	Grav.	Mag.	2-Unit	Cone.	4	Amid.	R.	Bev.	710x 90	Disk	½-El.	Tr.-R.
Solex	Grav.	Mag.	2-Unit	Cone.	4	Amid.	R.	Bev.	760x 90	Disk	½-El.	Tr.-R.
Zenith	Pres.	Mag.	None	Disk	4	Amid.	R.	Bev.	710x 90	Wire	½-El.	Tr.-R.
Zenith	Grav.	Mag.	1-Unit	Cone.	3	Amid.	R.	Bev.	710x 90	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Sp. Bev.	880x120	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Unit	R.	Sp. Bev.	820x120	Wire	Cant.	Tr.-R.
Solex	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Int. Gr.	760x 90	Disk	½-El.	Tr.-R.
Solex	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Int. Gr.	880x120	Wire	½-El.	Tr.-R.
Solex	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Int. Gr.	815x105	Disk	½-El.	Tr.-R.
Solex	Grav.	Mag.	2-Unit	Plate	3	Unit	C.	Chev.	710x 90	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Bev.	820x120	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Amid.	R.	Bev.	835x135	Disk	½-El.	Tr.-R.
Solex	Grav.	Delco	Delco	Plate	3	Amid.	R.	Sp. Bev.	710x 90	Steel	½-El.	Tr.-R.
Solex	Grav.	Delco	Delco	Plate	3	Unit	C.	Sp. Bev.	765x105	Steel	Trans.	Tr.-R.
Zenith	Grav.	Mag.	Lights only	Cone.	4	Amid.	R.	Bev.	710x 90	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Unit	R.	Bev.	880x120	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Unit	R.	Bev.	880x120	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Unit	R.	Bev.	880x120	Wire	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Cone.	4	Unit	R.	Bev.	880x120	Wire	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Bev.	820x120	Disk	½-El.	Tr.-R.
Zenith	Grav.	Mag.	2-Unit Own	Plate	4	Unit	R.	Sp. Bev.	760x 90	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit Own	Plate	4	Unit	R.	Sp. Bev.	880x120	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Disk	4	Unit	R.	Sp. Bev.	895x135	Wire	¾-El.	F.-Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Disk	4	Unit	R.	Sp. Bev.		Wire	¾-El.	F.-Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Disk	4	Unit	R.	Sp. Bev.	880x120	Wire	¾-El.	F.-Tr.-R.
Claudel	Vac.	Mag.	2-Unit Dynas.	Cone.	4	Unit	R.	Sp. Bev.	820x120	Wood	½-El.	R.
Claudel	Vac.	Mag.	2-Unit Dynas.	Cone.	4	Unit	R.	Sp. Bev.	880x120	Wood	½-El.	R.
Smith	Vac.	Delco	2-Unit Delco	Plate	4	Unit	C.	Sp. Bev.	835x135	Disk	Cant.	F.-R.
Smith	Vac.	Mag.	2-Unit	Plate	4	Amid.	R.	Worm	820x120	Cone.	Cant.	Tr.-R.
Zenith	Vac.	Mag.	1-Unit S.E.V.	Cone.	4	Amid.	R.	Bev.	815x105	Disk	½-El.	Tr.-R.
Own	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	815x105	Wire	Plat.	Tr.-R.
Own	Vac.	Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Plat.	Tr.-R.
Zenith	Vac.	Mag.	1-Unit	Cone.	4	Amid.	R.	Sp. Bev.	765x105	Disk	Cant.	Tr.-R.
Zenith	Vac.	Mag.&Bat.	2-Unit S.E.V.	Cone.	4	Amid.	C.	Sp. Bev.	880x120	Disk	Cant.	Tr.-R.
Cozette	Vac.	Mag.	2-Unit	Disk	3	Unit	L.	Sp. Bev.	820x120	Wire	½-El.	Tr.-R.
Cozette	Vac.	2 Mags.	2-Unit	Disk	3	Unit	L.	Sp. Bev.	895x135	Wire	½-El.	F.-Tr.-R.
Zenith	Vac.	Db. Del.	Delco	Cone.	4	Amid.	R.	Sp. Bev.	820x120	Wire	½-El.	Tr.-R.
Solex	Grav.	Delco	Delco	Cone.	4	Unit	R.	Bevel	760x 90	Disk	½-El.	Tr.-R.
Zenith	Grav.	Mag.	Elec. Light	Plate	3		R.	Chain	650x 65	Wire	¼-El.	R.
Own	Pres.	Delco	2-Unit Delco	Disk	3	Unit	R.	Sp. Bev.	895x135	Wire	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit S.E.V.	Disk	4	Amid.	R.	Sp. Bev.	880x120	Wire	Cant.	Tr.-R.
Solex	Grav.	Mag.	1-Unit	Cone.	4	Amid.	R.	Bev.	760x 90	Wood	½-El.	Tr.-R.
Solex	Grav.	Mag.	1-Unit	Cone.	4	Amid.	R.	Bev.	810x 90	Wood	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Cone.	4	Unit	R.	Bev.	815x105	Disk	Cant.	Tr.-R.
Own	Vac.	Delco	Delco	Disk	3	Unit	C.	Sp. Bev.	815x105	Steel	Cant.	R.
Own	Vac.	Del.&Mag.	2-Unit	Disk	4	Amid.	R.	Sp. Bev.	895x135	Wire	¾-El.	Tr.-R.
Claudel	Grav.	Mag.	Light only	Cone.	3	Amid.	R.	Bev.	710x 90	Disk	½-El.	Tr.-R.
Claudel	Grav.	Mag.	Light only	Cone.	3	Amid.	R.	Bev.	760x 90	Disk	½-El.	Tr.-R.
Vici	Vac.	Mag.	1-Unit	Cone.	Fric.		R.		760x 90	Disk	½-El.	R.
Solex	Grav.	Mag.	2-Unit	Disk	3	Unit	C.	Bev.	710x 90	Disk	½-El.	R.
Solex	Grav.	Mag.	2-Unit	Disk	3	Unit	C.	Bev.	760x 90	Disk	½-El.	R.
Zenith	Vac.	Mag.	2-Unit	Band	4	Amid.	R.	Chev.	820x120	Disk	½-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	R.	Bev.	820x120	Disk	¾-El.	Tr.-R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	R.	Bev.	835x135	Disk	¾-El.	Tr.-R.
Own	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	820x120	Wire	½-El.	R.
Own	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	880x120	Wood	½-El.	R.
Own	Vac.	Mag.	2-Unit	Plate	4	Unit	R.	Sp. Bev.	895x135	Wood	½-El.	R.
Zenith	Grav.	Mag.	Light	Cone.	4	Amid.	R.	Bev.	760x 90	Disk	½-El.	R.
Zenith	Grav.	Mag.	None	Cone.	3	Unit	R.	Worm	650x 65	Wire	¼-El.	R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	C.	Worm	710x 90	Wood	Cant.	R.
Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	R.	Sp. Bev.	820x120	Wire	Cant.	R.
2 Zenith	Vac.	Mag.	2-Unit	Disk	4	Unit	R.	Sp. Bev.	880x120	Wire	Cant.	R.
Zenith	Grav.	Mag.	2-Unit	Disk	3	Amid.	R.	Bev.	760x 90	Disk	½-El.	Tr.-R.
Cox-Atmos	Grav.	Mag.	2-Unit	Cone.	4	Unit	R.	Sp. Bev.	765x105	Disk	½-El.	F.-R.

Drive; Sp. Bev. spiral bevel. **Wheels;** Wood, detachable wood; Steel, spoked steel (Sankey type) Disk, steel disk (Michelin type). **Rear Springs;** El, elliptic; Cant. cantilever; Plat, platform (½ elliptic joined a transverse spring); Trans. transverse (Ford type). **Brake Location;** F. on front wheels; R. on rear wheels; Tr. on transmission.

Non-Ferrous Metal Specifications

(*Continued from page* 326)

General Information

The tensile strength of test-specimens about ½-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 25,000 to 30,000 lb. per sq. in. with an elongation of more than 1 per cent in 2 in.

The specific gravity is about 3.0 and a shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs.

This alloy is used extensively in England for such parts as crankcases, oil-pans, steering-wheel spiders and transmission cases.

Specification No. 32

Composition in percentage:

Aluminum, min.	85.50
Copper	11.00 to 13.50
Zinc, max.	0.20
Silicon, Iron, Zinc, Manganese and Tin, max.	1.70
Other Impurities.	None

General Information

The tensile strength of test-specimens about ½-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 19,000 to 23,000 lb. per sq. in. and the elongation will be practically nothing.

The specific gravity of this alloy is about 2.95 and a shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs. This alloy is used for manifolds, pumps, carbureters, cylinders and other parts which should be free from leaks and where the brittleness of the alloy is not objectionable.

Specification No. 33

Composition in percentage:

Aluminum	88.00 to 92.00
Copper	6.00 to 8.00
Zinc, max.	2.50
Iron, max.	1.50
Silicon, Manganese and Tin, max.	0.75
Other Impurities.	None

General Information

The tensile strength of test-specimens about ½-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 19,000 to 21,000 lb. per sq. in. with an elongation of 1 to 2 per cent in 2 in.

This is a light alloy having a specific gravity of 2.83 to 2.86 and is used extensively in the automotive industry. A shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs.

This alloy is similar to Specification No. 30 and is used for crankcases, oil-pans, steering-wheel spiders, differential carriers, transmission cases, camshaft housings, hub-caps and similar parts.

CAST BRASS ALLOYS

Specification No. 40 (Old No. 27), Red Brass

Composition in percentage:

Copper	83.00 to 86.00
Tin	4.50 to 5.50
Lead	4.50 to 5.50
Zinc	4.50 to 5.50
Iron, max.	0.35
Antimony, max.	0.25
Aluminum	None

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	27,000
Yield point, lb. per sq. in.	12,000
Elongation in 2 in. or proportionate gage length, per cent	16

This is a free-cutting brass with good casting and finishing properties.

(*Continued on page* 328)

Non-Ferrous Metal Specifications

(*Continued from page* 327)

Specification No. 43 (Old No. 29), Manganese Bronze

Composition in percentage:

Copper	53.00 to 62.00
Zinc	38.00 to 47.00
Lead, max.	0.15

This metal may be hardened by the addition of small amounts of tin, iron, manganese, aluminum or combination of these metals. The most importance should be placed on the following minima in physical requirements:

Ultimate strength, lb. per sq. in.	60,000
Yield point, lb. per sq. in.	30,000
Elongation in 2 in. or proportionate gage length, per cent.	15

General Information

This alloy is intended for use in castings where strength and toughness are required. It is equivalent to the copper-zinc alloys commercially known as Cast Manganese Bronze or its equivalents, such as Cast Tobin Bronze and Cast Naval Bronze.

Specification No. 41 (Old No. 28), Yellow Brass

Composition in percentage:

Copper	62.00 to 65.00
Lead	2.00 to 4.00
Zinc	31.00 to 36.00
Tin, max.	1.00
Iron, max.	0.50
Aluminum	None
Other impurities	.025

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	25,000
Yield point, lb. per sq. in.	12,000
Elongation in 2 in. or proportionate gage length, per cent.	20

This alloy is intended for use in commercial castings where cheapness and good machining properties are the main considerations.

Specification No. 42, White Nickel Brass

Composition in percentage:

Copper	55.00 to 64.00
Nickel, min.	18.00
Iron, max.	0.35
Aluminum	None
Other Impurities.	0.25
Zinc	Remainder

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	30,000
Elongation in 2 in. or proportionate gage length, per cent.	20

This brass is intended for use for trimmings or other parts requiring a metallic-white finish. The higher the nickel content, the more permanent will be the color.

Bronze Alloys

Bearings or gears made of bronze alloys should be used only against hardened steel.

Specification No. 62 (Old No. 43), Hard Cast Bronze

Composition in percentage:

Copper	86.00 to 89.00
Tin	9.00 to 11.00
Lead, max.	0.20
Iron, max.	0.06
Zinc	1.00 to 3.00

(*Continued on page* 329)

Specifications of Continental

Nationality and Make	Wheelbase (In.)	Track (In.)	No. of Cylinders	Valve Location	Cylinder Head	BORE AND STROKE Mm.	In.	Ratio	Piston Displacement (Cu. In.)	Camshaft Location	H.P. (Nominal)	Water Cooling	Lubricating System
Renault	103	56	4	L	Fix	75x120	2.95x4.73	1.6	129	C'case	10	Ther	Circ
Renault	120	56	4	L	Fix	80x140	3.15x5.52	1.7	172	C'case	12	Ther	Circ
Renault	130	56	4	L	Fix	95x160	3.74x6.30	1.7	330	C'case	18	Ther	Circ
Renault	145	56	6	L	Fix	100x160	3.94x6.30	1.6	460	C'case	40	Ther	Circ
Rochet Schneider	129	53	4	L	Fix	80x130	3.15x5.12	1.6	160	C'case	12	Ther	Pres
Rochet Schneider	133	56	4	L	Fix	95x140	3.74x5.52	1.4	242	C'case	18	Ther	Pres
Rochet Schneider	141	57	6	L	Fix	100x130	3.94x5.12	1.3	374	C'case	30	Pump	Pres
Roland Pilain	111	51	4	L	Fix	70x125	2.75x4.92	1.7	115	C'case	10	Ther	Pres
Roland Pilain	133	54	4	L	Fix	95x140	3.74x5.52	1.4	242	C'case	18	Ther	Pres
Roy	128	53	4	L	Fix	85x130	3.35x5.12	1.5	179	C'case	14	Pump	Pres
S. C. A. P.	110	51	4	L	Fix	76x130	2.99x5.12	1.7	144	C'case	14	Ther	Pres
Schneider, Th	125	55	4	L	Det	82.5x140	3.25x5.52	1.7	183	C'case	14	Pump	Pres
Schneider, Th	136	55	6	L	Det	82.5x140	3.25x5.52	1.7	275	C'case	30	Pump	Pres
Secq. Hoyau	114	54	4	L	Fix	60x110	2.36x4.33	1.8	75	C'case	10	Ther	Pres
Sigma	113	45	4	L	Fix	65x120	2.56x4.73	1.8	97	C'case	10	Ther	Circ
Sizaire-Naudin	130	54	4	L	Fix	75x130	2.95x5.12	1.7	139	C'case	12	Ther	Circ
Slim	132	55	4	I	Det	90x150	3.54x5.91	1.6	232	Head	20	Pump	Pres
Suere	94	47	8	L	Det	45x 90	1.77x3.54	2	70	C'case	12	Ther	Pres
Turcat-Mery	129	56	4	L	Fix	80x150	3.15x5.91	1.8	183	C'case	25	Pump	Pres
Unic	106	53	4	L	Fix	65x110	2.56x4.33	1.6	89	C'case	10	Ther	Pres
Unic	125	54	4	L	Fix	80x130	3.15x5.12	1.6	160	C'case	15	Pump	Pres
Vermorel	122	55	4	L	Fix	74x130	2.91x5.12	1.7	135	C'case	12	Ther	Circ
Vinot	117	53	4	L	Fix	80x130	3.15x5.12	1.6	159	C'case	14	Pump	Pres
Voisin	136	56	4	Sl	Det	95x140	3.74x5.52	1.4	242	C'case	18	Pump	Pres
Zebre	99	44	4	L	Fix	55x105	2.16x4.13	1.9	61	C'case	8	Ther	Pres
Zedel	117	48	4	L	Fix	82x130	3.23x5.12	1.5	167	C'case	13	Pump	Pres
ITALIAN													
Ansaldo	108	51	4	I	Det	70x120	2.75x4.73	1.7	111	Head	12	Pump	Pres
Bianchi	111	50	4	L	Fix	70x110	2.75x4.33	1.5	103	C'case	12	Pump	Pres
Bianchi	122	56	4	L	Fix	90x130	3.54x5.12	1.4	200	C'case	18	Pump	Pres
Bianchi	129	56	4	L	Fix	100x140	3.94x5.52	1.4	267	C'case	25	Pump	Pres
Bianchi	129	56	4	I	Fix	130x150	5.12x5.91	1.1	486	C'case	60	Pump	Pres
Chiribiri	102	49	4	L	Fix	65x120	2.56x4.73	1.8	97	C'case	12	Ther	Circ
Diatto	91	39	4	I	Fix	60x 90	2.36x3.54	1.5	62	Head	10	Pump	Pres
Diatto	99	43	4	I	Fix	68x100	2.67x3.94	1.4	88	Head	15	Pump	Pres
Diatto	112	55	4	L	Fix	85x120	3.35x4.73	1.4	165	C'case	25	Pump	Pres
Fiat	104	49	4	L	Det	65x110	2.56x4.33	1.6	89	C'case	10	Pump	Pres
Fiat	120	55	4	L	Det	75x130	2.95x5.12	1.7	139	C'case	15	Pump	Pres
Fiat	134	55	6	L	Det	75x130	2.95x5.12	1.7	210	C'case	20	Pump	Pres
Fast	128	56	4	I	Det	84x135	3.31x5.32	1.6	183	Head	15	Pump	Pres
Itala	120	56	4	L	Fix	80x130	3.15x5.12	1.6	159	C'case	25	Pump	Pres
Itala	122	56	4	L	Fix	105x150	4.13x5.91	1.4	316	C'case	35	Pump	Pres
Isotta	146	55	8	I	Det	85x130	3.35x5.12	1.5	358	C'case	50	Pump	Pres
Lancia	133	52	4	L	Det	110x130	4.33x5.12	1.1	301	C'case	35	Pump	Pres
S. P. A.	118	55	4	L	Fix	85x120	3.35x4.73	1.4	165	C'case	20	Pump	Pres
S. P. A.	137	56	6	I	Det	85x130	3.35x4.73	1.5	247	Head	40	Pump	Pres
Scat		53	4	L	Fix	75x120	2.95x4.73	1.6	128	C'case	18	Pump	Pres
Scat		58	4	L	Fix	100x150	3.94x5.91	1.5	286	C'case	30	Pump	Pres
SPANISH													
Elizalde	130	56	4	I	Det	75x130	2.95x5.12	1.7	139	Head	16	Pump	Pres
Elizalde	140	56	4	I	Det	85x150	3.35x5.91	1.7	208	Head	20	Pump	Pres
SWISS													
Martini	134	56	4	L	Fix	90x150	3.54x5.91	1.6	233	C'case	18	Pump	Pres
Piccard-Pictet		56	4	Sl	Det	85x130	3.35x5.12	1.5	180	C'case	16	Pump	Pres
Piccard-Pictet		56	8	Sl	Det	85x130	3.35x5.12	1.5	360	C'case	32	Pump	Pres

ABBREVIATIONS: Valve Location; L. both valves on one side in L, I. valves in head, Sl. sleeve valve. **Lubricating System;** Pres. pressure feed to main and connecting rod bearings. Circ. pump with pressure delivery to main bearings only (shaft not drilled). **Starting and Lighting;** West. Westinghouse. **Clutch;** Disk, multiple disk, Plate, one to three plates. **Gearset Location;** Amid-amidship, Unit, unit mounting with engine. **Position of Levers;** R, right; L, left; C, center. **Final**

Automobile Records

Competitive

SPEEDWAY RECORDS REGARDLESS OF CLASS, NON-STOCK

1 mile	0:40.23	De Palma	Mercedes	Des Moines, Iowa	June 24, 1916
2 miles	1:09.57	Louis Chevrolet	Frontenac	Chicago, Ill.	Sept. 3, 1917
3 miles	1:54.81	Resta	Peugot	Des Moines, Iowa	June 24, 1916
4 miles	2:14.22	Louis Chevrolet	Frontenac	Chicago, Ill.	Sept. 3, 1917
5 miles	2:56.35	Resta	Peugot	Omaha, Neb.	July 15, 1916
10 miles	5:20.20	Milton	Duesenberg	Sheepshead Bay, N. Y.	June 14, 1919
15 miles	8:18.90	De Palma	Packard Special	Chicago, Ill.	Sept. 3, 1917
20 miles	10:50.20	De Palma	Packard Special	Chicago, Ill.	July 28, 1918
25 miles	14:12.72	De Palma	Packard Special	Chicago, Ill.	Sept. 3, 1917
50 miles	26:23.40	De Palma	Packard	Sheepshead Bay, N. Y.	June 14, 1919
75 miles	42:40.28	Louis Chevrolet	Frontenac	Chicago, Ill.	Sept. 3, 1917
100 miles	54:17.80	G. Chevrolet	Frontenac	Sheepshead Bay, N. Y.	July 4, 1919
150 miles	1:26:14.90	Mulford	Hudson	Chicago, Ill.	June 16, 1917
200 miles	1:55:11.05	Mulford	Hudson	Chicago, Ill.	June 16, 1917
250 miles	2:23:04.03	Aitken	Peugot	Sheepshead Bay, N. Y.	Sept. 30, 1916
300 miles	2:55:32.23	Anderson	Stutz	Sheepshead Bay, N. Y.	Oct. 9, 1915
350 miles	3:24:42.99	Anderson	Stutz	Sheepshead Bay, N. Y.	Oct. 9, 1915
400 miles	4:04:48.98	Resta	Peugot	Chicago, Ill.	June 26, 1915
450 miles	4:35:05.78	Resta	Peugot	Chicago, Ill.	June 26, 1915
500 miles	5:07:26.00	Resta	Peugot	Chicago, Ill.	June 26, 1915

Passenger Car Chassis—Continued

Carbureter Make	Fuel Feed	Ignition	Starting and Lighting	Clutch	Speeds	Gearset Location	Position of Levers	Final Drive	Tires (Mm.)	Wheels	Rear Springs	Brake Location
Own	Grav.	Mag	2-Unit S.E.V.	Cone	3	Amid	C	Sp. Bev.	760x 90	Disk	Trans.	Tr.-R
Own	Grav.	Mag	2-Unit S.E.V.	Cone	4	Amid	R	Sp. Bev.	815x105	Wood	½-El.	Tr.-R
Own	Pres.	Mag	2-Unit S.E.V.	Cone	4	Amid	R	Sp. Bev.	820x120	Wood	½-El.	Tr.-R
Own	Pres.	Mag	2-Unit S.E.V.	Cone	4	Amid	R	Sp. Bev.	920x120	Wood	Cant.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Cone	4	Amid	R	Sp. Bev.	815x105	Disk	Cant.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Cone	4	Amid	R	Sp. Bev.	880x120	Disk	Cant.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Cone	4	Amid	R	Sp. Bev.	880x120	Disk	Cant.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Cone	4	Unit	R	Bev.	765x105	Disk	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Cone	4	Unit	R	Bev.	880x120	Wire	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Cone	4	Amid	R	Bev.	815x105	Disk	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Cone	4	Amid	R	Bev.	815x105	Disk	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	875x105	Steel	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	880x120	Steel	Cant.	Tr.-R
Claudel	Vac.	Mag	2-Unit	Plate	4	Amid	R	Sp. Bev.	710x 90	Wire	½-El.	Tr.-R
Zenith	Grav.	Mag		Cone	4	Unit	R	Bev.	760x 90	Disk	½-El.	Tr.-R
Zenith	Grav.	Mag	2-Unit	Cone	4	Amid	R	Bev.	815x105	Disk	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	895x135	Disk	½-El.	F.-Tr.-R
Zenith	Grav.	Delco	Delco	Cone	3	Unit	C	Bev.	710x 90	Disk	½-El.	Tr.-R
Zenith	Grav.	Mag	2-Unit	Cone	4	Unit	R	Sp. Bev.	820x120	Disk	½-El.	Tr.-R
Own	Grav.	Mag	None	Cone	4	Amid	R	Sp. Bev.	815x105	Disk	¾-El.	Tr.-R
Own	Vac.	Mag	S.E.V.	Cone	4	Amid	R	Sp. Bev.	820x120	Wire	Dbl.Cnt.	Tr.-R
Zenith	Vac.	Mag	2-Unit S.E.V.	Cone	4	Unit	C	Bev.	815x105	Steel	Cnt.&¼	Tr.-R
Zenith	Vac.	Mag	1-Unit	Cone	4	Amid	R	Sp. Bev.	820x120	Disk	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	880x120	Disk	Cant.	R
Zenith	Grav.	Mag	2-Unit	Plate	4	Unit	R	Bev.	710x 90	Wire	Cant.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Disk	4	Amid	R	Bev.	820x120	Steel	½-El.	Tr.-R
Zenith	Grav.	Mag	2-Unit	Disk	3	Unit	C	Sp. Bev.	760x 90	Wood	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	765x105	Wire	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	820x120	Wire	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	880x120	Wire	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Amid	R	Chain	920x120	Wire	½-El.	Tr.-R
Zenith	Grav.	Mag	Lights only	Cone	4	Amid	R	Bev.	710x 90	Disk	½-El.	R
Zenith	Vac.	Mag	2-Unit	Disk	4	Unit	R	Bev.	650x 65	Disk	¼-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Disk	4	Unit	R	Bev.	710x 90	Disk	¼-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Disk	4	Amid	R	Sp. Bev.	820x120	Wire	¼-El.	Tr.-R
Own	Grav.	Mag	2-Unit Fiat	Disk	4	Unit	R	Sp. Bev.	760x 90	Steel	½-El.	R
Own	Pres.	Mag	2-Unit Fiat	Disk	4	Unit	R	Sp. Bev.	820x120	Steel	½-El.	R
Own	Pres.	Mag	2-Unit Fiat	Disk	4	Unit	R	Sp. Bev.	895x135	Steel	½-El.	R
Zenith	Vac.	Mag	2-Unit	Disk	3	Unit	R	Bev.	820x120	Disk	½-El.	Tr.-R
Own	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	820x120		½-El.	Tr.-R
Own	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	895x135		½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit	Disk	4	Unit	C	Sp. Bev.	895x135	Disk	½-El.	F.-Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Amid	R	Bev.	895x135	Disk	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Unit	R	Sp. Bev.	820x120	Steel	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Disk	4	Unit	C	Sp. Bev.	895x135	Steel	½-El.	F.-Tr.-R
Zenith	Vac.	Mag	2-Unit West	Plate	4	Amid	R	Sp. Bev.	765x105	Metal	½-El.	Tr.-R
Zenith	Vac.	Mag	2-Unit West	Plate	4	Amid	R	Sp. Bev.	820x120	Metal	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Cone	4	Amid	R	Bev.	820x120	Disk	Cant.	F.-Tr.-R
Zenith	Pres.	Mag	2-Unit	Cone	4	Amid	R	Bev.	835x135	Wire	Cant.	F.-Tr.-R
Zenith	Vac.	Mag	2-Unit	Disk	4	Amid	R	Bev.	880x120	Wood	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	880x120	Wire	½-El.	Tr.-R
Zenith	Pres.	Mag	2-Unit	Plate	4	Unit	R	Sp. Bev.	895x135	Wire	½-El.	F.-Tr.-R

Drive; Sp. Bev. spiral bevel. **Wheels;** Wood, detachable wood; Steel, spoked steel (Sankey type) Disk, steel disk (Michelin type). **Rear Springs;** El, elliptic; Cant. cantilever; Plat, platform (½ elliptic joined a transverse spring); Trans. transverse (Ford type). **Brake Location;** F. on front wheels; R. on rear wheels; Tr. on transmission.

Non-Competitive Records

STRAIGHTAWAY RECORDS REGARDLESS OF CLASS, NON-STOCK

½ mile	0:11.57	Milton	Duesenberg	Daytona Apr. 27, 1920
1 kilo	0:14.40	Milton	Duesenberg	Daytona Apr. 27, 1920
1 mile	0:23.07	Milton	Duesenberg	Daytona Apr. 27, 1920
2 miles	0:46.24	Milton	Duesenberg	Daytona Apr. 27, 1920
3 miles	1:12.18	Milton	Duesenberg	Daytona Apr. 25, 1920
4 miles	1:36.14	Milton	Duesenberg	Daytona Apr. 25, 1920
5 miles	2:00.04	Milton	Duesenberg	Daytona Apr. 25, 1920
10 miles	4:09.31	De Palma	Packard Special	Daytona Feb. 16, 1919
15 miles	6:48.75	De Palma	Packard Special	Daytona Feb. 17, 1919
20 miles	8:54.20	De Palma	Packard Special	Daytona Feb. 17, 1919
(Standing Start)				
1 mile	0:38.83	De Palma	Packard Special	Daytona Feb. 17, 1919

SPEEDWAY RECORDS REGARDLESS OF CLASS, NON-STOCK

¼ mile	0:06.91	Rader	Packard Special	Sheepshead Bay, N. Y. July 28, 1917
½ mile	0:13.94	Rader	Packard Special	Sheepshead Bay, N. Y. July 28, 1917
1 kilo	0:17.35	Rader	Packard Special	Sheepshead Bay, N. Y. July 28, 1917
1 mile	0:28.76	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917
2 miles	0:57.81	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917
3 miles	1:26.61	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917
4 miles	1:55.74	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917
5 miles	2:24.65	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917
10 miles	4:50.88	Rader	Packard Special	Sheepshead Bay, N. Y. July 27, 1917

Non-Ferrous Metal Specifications

(*Continued from page* 328)

General Information

Good castings made of this bronze should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	30,000
Yield point, lb. per sq. in.	15,000
Elongation in 2 in. or proportionate gage length, per cent	14

This alloy is suitable wherever a strong general utility bronze is required. It may be used for severe working conditions where heavy pressures obtain, as in gears and bearings.

Specification No. 63, Leaded Gun Metal

Composition in percentage:

Copper	86.00 to 89.00
Tin	9.00 to 11.00
Phosphorus, max.	0.25
Zinc and Other Impurities, max.	0.50
Lead	1.00 to 2.50

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	30,000
Yield point, lb. per sq. in.	12,000
Elongation in 2 in. or proportionate gage length, per cent	10

Combining strength with fair machining qualities, this general utility bronze is especially good for bushings subjected to heavy loads and severe working conditions.

Specification No. 65, Phosphor Gear Bronze

Composition in percentage:

Copper	88.00 to 90.00
Tin	10.00 to 12.00
Phosphorus	0.10 to 0.30
Lead, Zinc, and Other Impurities, max.	0.50

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	35,000
Yield point, lb. per sq. in.	20,000
Elongation in 2 in. or proportionate gage length, per cent	10

This is a very hard bronze and may be used for gears and worm wheels where the requirements are severe.

Specification No. 66, Bronze Backing for Lined Bearings

Composition in percentage:

Copper	83.00 to 86.00
Tin	4.50 to 6.00
Lead	8.00 to 10.00
Zinc, max.	2.00
Impurities, max.	0.25

General Information

Good castings made of this alloy should give the following minima in physical characteristics:

Ultimate strength, lb. per sq. in.	25,000
Yield point, lb. per sq. in.	12,000
Elongation in 2 in. or proportionate gage length, per cent	10

This composition is recommended as an inexpensive but suitable alloy for bronze-backed bearings.

(*Continued on page* 384)

Exports of Passenger Automobiles for

	1907	1910	1912	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31, 1918	Calendar Year 1919	1920	Totals for All Years Inc. 1908, 1909, 1911
Europe:													
Austria	8 $16,611	25 $26,178	100 $78,748	134 $91,781	314 $190,199	4 $2,310	.....	.....	.....	.....	12 $15,000	13 $7,927	672 $466,861
Azores and Madeira Islands	....	2 $2,006	13 $7,886	16 $10,549	20 $10,771	18 $10,119	6 $2,272	1 $700	.....	.....	25 $12,078	12 $11,519	54 $69,145
Belgium	35 $58,859	58 $147,375	122 $140,585	94 $85,679	244 $139,681	12 $15,191	.....	.....	.....	.....	1,628 $1,784,133	2,450 $2,888,057	4,804 $5,584,429
Bulgaria	....	2 $1,890	28 $19,716	17 $11,457	43 $21,679	.....	.....	.....	.....	.....	1 $3,220	17 $21,105	117 $82,377
Denmark	40 $30,464	46 $46,024	51 $41,976	81 $77,149	263 $176,947	219 $156,296	806 $548,971	1,215 $932,768	2 $4,100	96 $155,416	2,519 $2,961,948	1,099 $1,349,134	6,549 $6,560,226
Finland	....	....	24 $26,203	51 $53,568	106 $83,835	17 $9,163	.....	.....	.....	.....	187 $254,378	82 $123,859	471 $563,955
France	111 $489,047	246 $771,869	574 $469,721	818 $615,086	1,427 $919,060	451 $252,909	2,087 $1,428,325	1,367 $836,557	1,169 $1,518,858	495 $331,144	866 $1,999,773	582 $933,234	10,895 $12,351,802
Germany	66 $141,371	100 $265,218	288 $226,227	845 $764,389	1,411 $1,040,787	16 $17,364	.....	.....	.....	.....	.....	37 $72,319	2,975 $3,045,597
Gibraltar	1 $2,500	.....	1 $1,673	7 $6,576	64 $33,030	9 $6,077	15 $16,165	9 $11,518	.....	.....	34 $27,493	86 $86,276	229 $200,521
Greece	.....	.....	14 $9,355	5 $4,080	25 $28,256	36 $28,431	124 $118,398	78 $79,913	4 $6,580	.....	269 $407,822	685 $876,220	1,245 $1,462,920
Hungary	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2
Iceland and Faroe Islands	.....	.....	.....	2	5	3	.....	11	15	25	.....	$3,500 74	$3,500 166
Italy	93 $249,192	93 $333,193	211 $193,037	$1,016 331 $280,961	$2,488 342 $241,466	$2,128 114 $70,265	382 $217,240	$5,134 186 $126,432	$11,396 129 $78,228	$22,666 21 $32,345	$58,526 26 $59,531	$30,553 954 $1,197,063	$133,907 3,153 $3,451,618
Malta, Gozo and Cyprus Is	.....	.....	1 $500	.....	1 $422	.....	.....	.....	.....	.....	29	146	177
Netherlands	19 $49,146	33 $76,957	103 $78,363	111 $94,163	141 $117,131	96 $131,801	439 $399,017	485 $612,495	.....	.....	$19,065 1,160 $1,387,680	$129,504 3,103 $2,626,862	$149,441 9,750 $5,722,075
Norway	1 $330	22 $20,669	78 $66,897	78 $66,689	145 $118,338	125 $89,357	732 $592,560	922 $944,002	97 $115,810	187 $398,266	1,835 $2,355,339	3,200 $4,025,685	7,449 $8,821,580
Poland and Danzig	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	232	232
Portugal	.....	9 $11,429	15 $14,752	73 $58,931	59 $65,545	14 $18,255	204 $198,975	283 $271,421	223 $270,987	26 $38,228	320 $105,880	$237,139 540 $843,837	$237,139 1,754 $2,226,473
Roumania	.....	.....	31 $22,543	38 $30,337	28 $17,018	.....	2 $3,000	.....	.....	.....	310 $277,884	173 $150,634	631 $537,443
Russia in Europe	32 $27,638	97 $107,310	261 $254,047	580 $484,913	926 $898,458	907 $1,527,768	1,268 $3,142,616	780 $943,003	492 $1,136,500	6 $6,605	17 $8,426	328 $413,900	5,940 $9,206,223
Serbia, Montenegro & Albania	.....	.....	4 $2,520	2 $1,160	4 $2,843	2 $2,950	3 $4,200	.....	.....	.....	.....	11 $10,431	27 $24,756
Spain	10 $10,640	12 $18,330	174 $116,202	186 $127,621	83 $64,758	71 $59,555	364 $299,367	1,125 $1,195,887	1,205 $1,346,826	459 $610,844	1,458 $1,759,606	3,796 $5,576,482	9,020 $11,253,633
Sweden	53 $63,051	45 $55,118	169 $127,729	256 $235,918	324 $253,588	137 $108,652	238 $180,869	390 $360,554	95 $111,377	1 $2,800	1,546 $2,021,948	5,396 $6,766,770	8,754 $10,405,373
Switzerland	1 $750	.....	12 $7,873	22 $24,965	79 $56,838	2 $1,244	6 $4,499	9 $9,248	3 $1,533	1 $1,646	428 $472,549	1,412 $1,781,037	1,989 $2,373,686
Turkey in Europe	1 $2,000	.....	22 $13,886	13 $9,814	35 $21,052	.....	.....	.....	.....	.....	68 $52,504	486 $415,634	637 $524,626
England		1,258 $2,391,984	5,660 $4,403,361	3,783 $2,893,785	6,992 $5,615,487	8,321 $6,849,145	9,810 $6,933,806	1,268 $1,444,346	742 $1,712,672	88 $134,102	5,150 $5,573,843	18,744 $20,978,357	64,588 $62,838,536
Scotland	739 $1,414,056	12 $18,109	261 $28,901	580 $8,104	926 $46,948	907 $82,708	1,268 $124,138	780 $2,991	492 $217,000	6	17 $34,633	328 $603,617	5,940 $796,027
Ireland		1 $5,500	34 $22,186	6 $5,538	2 $1.593	159 $157,091	60 $55,014	.....	.....	.....	914 $897,065	902 $1,023,255	3,598 $5,219,664
North America:													
Bermuda	 3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1* $1,800
British Honduras	$4,020	.....	.....	1 $1,800	4 $3,929	1 $550	.....	12 $5,774	8 $6,858	6 $4,650	25 $15,598	19 $12,993	80 $58,673
Canada	611 $969,385	3,102 $3,340,326	6,288 $7,560,655	6,723 $8,229,324	4,377 $5,445,052	4,127 $3,723,125	10,017 $6,555,334	14,421 $11,143,740	12,985 $10,189,865	1,625 $1,461,776	8,826 $9,393,009	8,046 $10,869,891	87,450 $86,087,042
Central American States:													
Costa Rica	.....	2 $1,823	13 $12,603	13 $14,955	20 $17,877	9 $3,897	60 $28,325	37 $23,125	199 $85,070	.....	20 $19,470	98 $116,291	490 $340,575
Guatemala	4 $2,743	16 $22,094	19 $38,109	10 $14,892	26 $36,763	10 $12,012	24 $23,552	35 $36,174	34 $46,657	2 $1,815	125 $151,667	169 $223,149	519 $666,828
Honduras	.....	.....	3 $7,114	4 $8,100	4 $3,826	31 $20,422	34 $22,652	42 $24,654	16 $12,292	6 $11,093	22 $14,549	44 $42,248	208 $167,812
Nicaragua	3 $2,050	.....	.....	.....	.....	.....	.....	.....	49 $32,031	28 $28,991	71 $61,923	157 $170,165	308 $295,060
Panama	2 $1,170	13 $13,289	20 $14,271	39 $43,432	58 $51,906	110 $85,990	228 $170,964	356 $216,711	129 $93,329	13 $13,864	173 $164,698	316 $323,929	1,487 $1,226,844
Salvador	.....	3 $5,565	6 $10,658	11 $13,212	10 $13,323	16 $8,888	68 $54,598	75 $62,314	54 $68,297	32 $36,884	86 $124,996	191 $290,088	484 $714,132
Mexico	465 $681,086	245 $459,077	273 $418,599	235 $423,123	155 $239,166	70 $66,830	383 $309,200	2,807 $1,642,011	2,578 $1,653,545	770 $793,614	2,850 $2,360,346	4,089 $3,525,210	15,614 $13,822,767
Newfoundland and Labrador	3 $9,828	15 $18,285	14 $13,812	9 $10,353	5 $2,761	17 $11,681	21 $15,632	48 $38,910	27 $34,676	68 $72,887	138 $160,414	96 $139,584	299 $550,642
West Indies, British:													
Barbados			16 $11,310	7 $5,973	14 $12,320	19 $8,699	63 $30,688	121 $62,364	58 $33,198	4 $3,300	76 $56,797	146 $124,483	546 $271,685
Jamaica			53 $52,659	62 $59,131	66 $61,475	80 $61,622	273 $205,239	335 $202,375	236 $149,673	43 $39,701	121 $116,425	421 $401,789	2,748 $1,431,457
Trinidad & Tobago	35 $56,059	102 $157,459	31 $31,343	43 $39,902	47 $49,079	59 $40,281	128 $87,167	204 $112,014	161 $100,571	19 $18,474	182 $137,564	450 $414,679	1,331 $1,029,049
Other British			4 $1,960	7 $6,716	13 $11,061	38 $18,463	100 $51,612	124 $80,879	80 $50,009	24 $15,603	53 $35,966	151 $127,046	805 $741,763
Cuba	67 $129,226	120 $187,392	202 $234,569	223 $242,686	297 $254,428	1,359 $745,695	3,698 $2,091,295	3,529 $2,545,071	2,846 $3,029,813	871 $1,295,485	2,887 $3,121,228	6,293 $7,096,895	22,728 $21,480,244
Danish (Virgin Is. of U.S.)	.....	.....	5 $3,303	4 $2,131	3 $2,954	3 $1,375	9 $3,426	18 $9,114	152 $12,313	13 $9,194	27 $20,010	66 $46,925	301 $112,468
Dominican Republic	1 $1,650	1 $4,000	13 $12,739	7 $5,382	11 $15,195	28 $14,609	131 $60,127	191 $96,173	248 $157,607	99 $87,290	173 $174,204	593 $577,560	1,521 $1,229,947
Dutch	.....	.....	3 $1,647	19 $14,590	13 $9,605	24 $16,829	21 $10,945	32 $19,191	12 $7,435	2 $1,295	13 $7,369	69 $67,376	210 $156,858
French	.....	.....	.....	5 $3,877	65 $48,377	54 $34,906	101 $63,670	293 $154,990	248 $146,698	25 $21,561	156 $137,929	148 $129,703	1,096 $742,111
Haiti	.....	1 $1,510	2 $910	38 $24,499	2 $1,485	.....	10 $3,788	29 $13,780	102 $54,613	22 $18,408	179 $158,594	202 $171,293	587 $448,880

*Year 1908.

the Years 1907 to 1920 Inclusive

	1907	1910	1912	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31, 1918	Calendar Year 1919	1920	Totals for All Years Inc. 1908, 1909, 1911
South America:	39	268	727	1,062	940	626	4,399	3,924	3,525	559	2,202	4,597	23,390
Argentina	$58,070	$174,677	$860,350	$1,181,735	$963,586	$294,129	$2,065,439	$2,336,001	$2,666,898	$708,853	$2,711,232	$5,828,057	$20,426,230
	2	.....	.....	2	4	10	26	141	152	4	14	24	379
Bolivia	$1,550	.....	.....	$1,493	$12,764	$5,462	$16,208	$100,151	$105,408	$8,548	$13,846	$39,634	$305,064
	52	64	554	987	299	81	272	873	1,575	442	3,273	3,251	11,983
Brazil	$57,037	$67,687	$662,883	$1,035,247	$264,992	$52,939	$157,968	$523,383	$1,000,011	$424,317	$2,580,304	$6,761,382	$13,917,488
	44	3	30	78	195	120	826	2,587	3,399	673	454	797	9,239
Chile	$52,905	$1,824	$39,873	$109,982	$160,194	$64,327	$530,211	$1,821,842	$3,576,511	$1,009,964	$700,997	$992,539	$9,097,916
	.....	12	42	110	79	39	91	173	164	30	253	962	1,971
Colombia	.....	$22,482	$35,386	$113,334	$69,620	$34,956	$58,525	$118,937	$121,422	$27,542	$298,383	$1,247,976	$2,164,618
	.....	2	21	74	21	20	62	137	142	22	84	201	794
Ecuador	.....	$2,168	$20,578	$55,372	$21,229	$11,233	$44,396	$106,478	$130,086	$29,471	$111,051	$288,884	$735,991
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	4
Falkland Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$5,788	.....	$5,788
	.....	4	20	18	16	45	73	146	180	18	49	130	707
Guiana, British	.....	$5,952	$17,306	$114,313	$11,364	$24,311	$33,933	$65,989	$100,546	$18,472	$39,369	$92,665	$430,508
	.....	.....	.....	.....	7	9	15	23	16	.....	7	10	87
Dutch	.....	.....	.....	.....	$3,948	$4,492	$7,181	$11,797	$17,775	.....	$3,872	$12,706	$54,027
	.....	.....	1	1	.....	.....	1	1	8	1	3	3	19
French	.....	.....	$580	$558	.....	.....	$1,000	$498	$3,632	$318	$2,167	$5,264	$14,017
	5	1	.....	.....	.....	5	6	40	13	.....	13	102	186
Paraguay	$2,394	$1,200	.....	.....	.....	$2,308	$2,256	$20,192	$5,025	.....	$5,780	$64,967	$104,679
	8	4	13	70	36	24	59	400	784	257	599	1,297	3,565
Peru	$6,428	$5,004	$10,833	$55,646	$31,362	$20,658	$40,388	$295,558	$913,699	$395,753	$662,528	$1,249,546	$3,701,516
	1	20	177	209	183	45	285	1,165	2,232	418	1,844	4,090	10,777
Uruguay	$625	$23,666	$235,097	$273,253	$167,269	$25,706	$150,540	$612,838	$1,177,463	$307,221	$1,757,623	$4,055,458	$8,952,700
	1	.....	26	104	126	227	518	542	160	38	293	881	2,936
Venezuela	$1,000	.....	$28,180	$109,499	$102,073	$143,086	$314,156	$327,507	$97,485	$56,021	$300,888	$820,040	$2,299,935
Asia:	.....	.....	.....	15	28	9	16	10	8	.....	29	52	168
Aden	.....	.....	.....	$7,998	$20,990	$6,706	$9,166	$7,968	$6,879	.....	$25,197	$50,387	$136,079
	16	8	78	89	114	122	264	509	833	.....	1,158	1,774	5,427
China	$15,255	$13,785	$98,730	$90,459	$143,619	$119,635	$191,932	$383,371	$818,659	$402,275	$1,414,844	$2,356,699	$6,100,364
	.....	.....	.....	.....	.....	.....	.....	53	28	38	36	62	209
*Kwantung (leased territory)	.....	.....	.....	.....	.....	.....	.....	$27,121	$12,338	$29,335	$28,995	$68,491	$172,230
	.....	1	.....	7	2	2	7	5	2	3	11	595	638
Chosen (Korea)	.....	$10,270	.....	$6,095	$1,795	$1,800	$4,780	$3,832	$1,300	$2,295	$9,272	$311,457	$356,204
	45	26	253	439	437	315	2,289	3,603	73	27	2,624	12,014	22,313
British India	$26,067	$22,372	$203,740	$355,573	$379,954	$274,680	$1,638,262	$2,644,085	$53,428	$42,756	$2,891,943	$13,865,679	$22,544,250
	9	21	120	387	262	77	376	855	287	49	499	2,334	5,342
Straits Settlements	$4,754	$20,955	$86,668	$319,247	$216,659	$70,210	$239,715	$585,820	$202,221	$53,934	$572,320	$2,638,794	$5,064,913
	.....	4	25	39	82	25	239	110	11	.....	102	440	1,091
Other British East Indies	.....	$2,875	$20,882	$31,245	$73,175	$20,208	$168,685	$80,033	$17,740	.....	$114,609	$540,146	$1,089,513
	67	33	120	278	290	105	1,064	3,206	1,272	1,078	1820	4,765	14,310
Dutch East Indies	$36,629	$21,768	$70,055	$198,378	$208,722	$87,306	$753,128	$2,642,330	$1,302,800	$1,359,811	$2,369,241	$6,500,062	$15,705,307
	.....	.....	.....	.....	.....	.....	8	18	18	12	37	537	630
French East Indies	.....	.....	.....	.....	.....	.....	$3,033	$17,967	$21,175	$18,069	$43,918	$568,961	$673,123
	9	2	4	7	11	2	15	38	117	86	144	214	654
Hongkong	$7,372	$3,788	$2,740	$6,673	$13,043	$1,475	$10,858	$35,255	$91,228	$86,006	$188,121	$341,191	$791,067
	15	12	118	312	96	28	153	652	2,139	1,514	2,805	2,796	10,714
Japan	$19,242	$26,759	$143,610	$364,507	$100,995	$29,210	$120,061	$481,748	$2,040,897	$1,608,516	$2,890,034	$2,983,497	$10,890,235
	.....	.....	.....	.....	.....	.....	.....	.....	2	8	4	128	142
Persia	.....	.....	.....	.....	.....	.....	.....	.....	$1,048	$4,625	$2,275	$169,518	$177,466
	2	3	.....	1	12	551	683	1,072	5	3	49	76	2,457
Russia in Asia	$1,884	$1,760	.....	$1,160	$14,998	$1,477,809	$529,385	$1,324,060	$8,425	$11,734	$52,145	$124,235	$3,547,595
	4	4	13	56	37	13	41	31	65	27	71	82	455
Siam	$1,569	$6,407	$8,933	$35,934	$26,219	$10,317	$32,082	$15,915	$60,220	$22,005	$70,210	$92,457	$391,757
	.....	1	1	1	7	1	.....	.....	.....	6	119	1,010	1,150
Turkey in Asia	.....	$1,200	$650	$824	$5,662	$1,000	.....	.....	.....	$3,965	$116,347	$807,796	$945,996
Oceania, British:	62	437	2,597	2,083	3,099	2,169	5,335	5,055	4,307	1,582	3,905	8,882	40,773
Australia	$57,731	$268,274	$2,260,320	$1,896,990	$2,615,896	$1,768,479	$4,147,302	$3,792,571	$3,410,557	$1,492,899	$4,016,751	$9,936,869	$36,685,352
	69	77	953	958	1,065	938	2,672	3,554	1,818	639	2,959	6,671	22,905
New Zealand	$120,533	$55,236	$946,736	$990,837	$974,708	$784,206	$2,055,843	$2,558,118	$1,453,311	$607,807	$3,314,891	$8,150,277	$22,510,425
	.....	.....	75	3	9	2	28	19	30	7	23	28	242
Other British	.....	.....	$73,932	$2,396	$6,014	$2,081	$18,227	$11,062	$20,863	$5,955	$17,264	$31,065	$213,273
	.....	1	3	11	46	8	92	22	12	3	11	13	222
French	.....	$900	$2,920	$14,005	$45,184	$7,482	$56,789	$12,330	$7,612	$3,368	$11,118	$14,255	$275,964
	.....	.....	.....	1	.....	1	7	12	12	7	8	22	70
German	.....	.....	.....	$350	.....	$5,000	$3,208	$5,847	$11,029	$4,935	$6,285	$16,165	$52,815
	2	130	401	517	614	407	861	1,019	1,714	603	2,381	3,452	12,510
Philippine Islands	$1,205	$175,626	$557,368	$577,040	$697,175	$425,001	$859,450	$686,731	$1,373,204	$616,437	$2,629,348	$3,932,108	$12,955,541
Africa:	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	5
Abyssinia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$2,416	$2,416
Belgian Kongo	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24	24
	.....	.....	.....	4	32	42	63	240	202	43	357	$16,325	$16,325
British Africa, West	.....	.....	.....	$2,688	$18,319	$20,899	$35,361	$144,838	$115,772	$37,351	$393,405	753	1,736
	2	75	331	1,279	1,618	695	2,859	3,423	2,142	541	3,019	$913,814	$1,682,447
South	$1,817	$61,185	$306,606	$1,157,895	$1,437,883	$731,278	$2,040,977	$2,378,380	$1,706,136	$530,951	$3,462,330	6,688	22,835
	.....	11	22	14	49	120	237	94	112	14	82	$7,795,194	$21,760,665
East	.....	$10,463	$14,998	$12,802	$34,430	$75,188	$137,245	$55,681	$75,778	$14,445	$80,954	373	1,135
	1	3	10	10	15	27	51	31	15	.....	6	$432,819	$856,317
Canary Islands	.....	$850	$2,066	$6,426	$6,956	$12,015	$32,935	$24,525	$5,378	.....	$10,162	154	315
	2	1	5	16	22	1	25	38	21	6	230	$200,745	$305,288
Egypt	$887	$998	$2,872	$10,156	$11,437	$695	$18,352	$22,113	$17,300	$20,850	$165,244	3,607	3,980
	1	11	30	10	19	.....	2	41	121	89	198	$1,453,898	$1,839,701
French Africa	$950	$18,188	$20,164	$7,297	$17,273	.....	$1,155	$13,315	$50,550	$52,757	$144,023	365	912
	.....	.....	.....	5	19	7	20	.....	.....	.....	7	$297,191	$644,688
German Africa	.....	.....	.....	$3,175	$14,136	$4,865	$7,760	.....	.....	.....	$3,721	30	88
	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	$21,948	$55,605
Italian Africa	.....	.....	.....	.....	.....	.....	.....	$1,200	.....	.....	.....	5	8
	.....	.....	.....	.....	.....	.....	.....	1	12	.....	.....	$3,075	$4,275
Liberia	.....	.....	.....	$805	.....	.....	.....	$975	$4,220	.....	.....	1	15
	.....	.....	.....	.....	.....	.....	7	1	2	.....	.....	$1,205	$7,205
Madagascar	.....	.....	.....	.....	.....	.....	$2,532	$808	$1,659	.....	.....	4	14
	.....	.....	.....	.....	63	25	52	87	35	.....	237	$4,205	$9,204
Morocco	.....	.....	.....	.....	$29,497	$10,847	$20,574	$39,670	$17,718	.....	$162,016	364	863
	1	7	16	20	24	6	56	7	9	12	18	$340,490	$620,812
Portuguese Africa	$2,110	$5,302	$13,096	$16,102	$21,563	$7,301	$38,510	$5,429	$9,673	$8,598	$16,636	244	423
Grand Total												$282,203	$429,192
													526,592
													$517,614,256

*Previous to 1918 listed as British, French and Japanese China.

Export Specifications of American Passenger Cars

Name and Model	Boxing Charge	Cubic Contents Car Boxed	Cubic Contents Chassis Boxed	Magneto	Extra Charge	Right Hand Drive?	Extra Charge	Wheel Options	Extra Charge	Color Options	Extra Charge	Tire Sizes	Rim Type	Tire Type
Allen 43	$70	312	208	Bosch	$35	Yes	None	Wire & Disc	$100-$100	5		32x4	S.S.	Fabric
Amco	75	334	169	Yes	35	Yes	$15					31x4	S.S.	
American 6	80	359		Bosch	75	Yes	30	Wire & Disc	100-150	3	None	610x105	S.S.	Cord
Anderson	100	382	295	Bosch	45	Yes	25	Wire & Disc	125-160	Yes	$100	33x4	S.S.	Fabric
Apperson 820	100	415	370			Yes	50	Wire	125	None		34x4½	S.S.	Cord
Apperson Anniv	100	415	370			Yes	50	Wire & Disc	None	None		34x4½	S.S.	Cord
Auburn 6-39H	100	364	290	Bosch	55	Yes		Wire & Disc	150-150	3	None	880x120		Fabric
Beggs	85	375			50	Yes	25					33x4	S.S.	
Bell	75	334	171		35	Yes	15					31x4	S.S.	
Bour Davis	95	380			75	Yes	None					33x4½		
Briscoe	50	300		Splitdorf	35	Yes	None	Wire	65	2		31x4		Fabric
Buick 49, 50	Yes	578	131			Yes				4		880x120	S.S.	Fabric
Buick 44 to 47	Yes	548	320			Yes				4		34x4½	S.S.	Fabric
Cadillac 59		630	243			Yes		Wire		12	Yes	895x135	S.S.	Opt
Champion Spec	60			Yes	40	Yes	5	Wire	150	None		32x4	S.S.	Fabric
Chandler	85	382	338	Bosch	None	Yes	None	Wire	Yes	1			S.S.	Fabric
Chevrolet 490	63	191	95-	Berling		Yes		Wire		Yes	Yes	815x120	S.S.	Fabric
Chevrolet FB		313	145	Simms		Yes		Wire		Yes		815x120	S.S.	Fabric
Climber	125	333	246		60	Yes	75	Wire & Disc	75-100	All	None	33x4	S.S.	Fabric
Climber	125	347	249	Bosch	None	Yes	75	Wire & Disc	75-100	All	None	32x4½	S.S.	Fabric
Cole	100	462	336			Yes	None	Wire & Disc	125-150	5	75	880x135	S.S.	Cord
Columbia	70	340	225	Bosch	55	Yes	None	Wire & Disc	75-150	All		815x105	Opt	Cord
Comet	85	385			60	Yes	25					33x4		
Crow Elkhart S5S		335		Eisemann	85	Yes		Wire & Disc	100-150	10	None	33x4	S.S.	Fabric
Crow Elkhart L5S		335		Eisemann	85	Yes		Wire & Disc	100-150	10		33x4	S.S.	Fabric
Cunningham V	Yes	640		None		No		Wire & Disc	None—75	Yes	None			Cord
Davis 51-57	100	390				Yes	None	Wire & Disc	125-160	2		635x105	S.S.	Cord
Dixie-Flyer	63	304		Eisemann		Opt		Wire	120	All	45		S.S.	Cord
Dodge Brothers				Simms	25	Yes	25				None		S.S.	Opt
Dorris 6-80	125			Bosch		No		Wire & Disc	225-140	Yes	Yes	33x5	S.S.	Cord
Dort				Bosch		Yes	None	Wire	Yes	None		30x3½		Fabric
Elgin		340		Bosch	50	Yes	35	Disc	None	None		33x4	S.S.	Fabric
Essex	Yes	318				Yes		Wire	Yes	2		815x105	S.S.	Fabric
Ford		273	129	Yes	None	No						30x3½	C.	Fabric
Franklin	85	389				No		Wire	60	Yes	100	32x4	S.S.	Cord
Gardner		307		Yes		Yes		Wire	175	None		32x3½	S.S.	Fabric
Grant		344	290	Bosch	50	Yes	None	Wire	100					Fabric
Haynes	90	500	400	Simms	70	Yes	30	Wire & Disc	150-200	3	100	34x4½	S.S.	Cord
Holmes	100		400	Eisemann	None	No		Wire	145	1	75		S.S.	Cord
Hudson Super 6	Yes	393	370			Yes		Wire	Yes	2		880x120	S.S.	Fabric
Huffman	75	373	322			Yes	None	Wire	135	3	None		S.S.	Fabric
Hupmobile	70	322		Splitdorf		Yes		Wire	100	2		815x105	S.S.	Fabric
Jackson 6	80	390		Bosch	35	Yes	25	Wire & Disc	100-100	5		33x4	S.S.	Fabric
Jordan M	100	372	295	Bosch	50	Yes	50	Wire & Disc	125-150	1		32x4	S.S.	Cord
Jordan F	100	400	340	Bosch	50	No		Wire & Disc	125-150	1	None	32x4½	S.S.	Cord
Kissel	110	466	404	Bosch	50	Yes	None	Wire & Disc	- 70	1	100	32x4½	S.S.	Cord
Kline Kar	90	630	450	Bosch	70	Yes	30	Wire & Disc	125-125	Yes			S.S.	Fabric
Lexington	90		329	Bosch	75	Yes		Wire & Disc	125-150	None		32x4	S.S.	Cord
Liberty 6	75	280	246	Splitdorf	Yes	Yes	Yes	Wire		5		32x4		Opt
Locomobile	125	465		Berling	None	No		Wire	250	18		35x5	S.S.	Cord
Maibohm	110	314		Bosch	50	Opt	25	Wire & Disc	100-150	4		32x4	S.S.	Cord
Marmon 34	110	526	433	Simms		Yes		Wire	None	None		815x120	S.S.	Cord
McFarlan	135	375		Berling	None	Yes	None	Wire & Disc	None	All		35x5	S.S.	Cord
Mercer	115	365		Eisemann	None	Yes		Wire	128	7	None	32x4½	S.S.	Cord
Metz 6	80	355	244	Bosch	50	Opt	50	Wire & Disc	100	1		32x4	Opt	Fabric
Mitchell	65	374	215	Bosch	75	Yes	None	Wire	80	1	None	815x105	Opt	Fabric
Moon 6-42	85	410	300	Bosch	None	Yes	None	Wire & Disc	100-115	2	None	815x105	S.S.	Fabric
Moon 6-68	95	418	300	Splitdorf	50	Yes	None	Wire & Disc	110-115	2	None	32x4½	S.S.	Cord
Nash 681	60			Bosch	40	Opt	25	Wire	100	2	None	875x105	Opt	Cord
Nash 682	60			Bosch	40	Opt	25	Wire	100	1		875x105	S.S.	Cord
National	100	539	449	Bosch				Wire & Disc	125-125	3	None	32x4½	S.S.	Cord
Noma 1D		423				No		Wire & Disc		None		32x4½	S.S.	Cord
Oakland		478		Remy		Yes		Wire				880x120	S.S.	Fabric
Oldsmobile		358				Yes		Wire & Disc			Yes	880x120	S.S.	Fabric
Overland		278	128	Bosch	51	Yes		Wire				30x3½	C	Fabric
Packard Six	80	483		Delco		No		Wire	Yes	2	Yes	33x4½	S.S.	Cord
Packard Twin 6	110	532		Delco		No		Wire & Disc		1		35x5		Cord
Paige		358		Bosch	55	Yes	None	Wire & Disc	90-110	All	35			Fabric
Paterson	100					Yes		Wire & Disc	100-125	3	None	33x4	S.S.	
Peerless		390	262					Wire	207	All	50	34x4½	S.S.	Cord
Piedmont 4-30	60	280	180	Splitdorf	50	Yes	10	Wire	100	All	25	32x3½	S.S.	Fabric
Pierce Arrow 6	130	527	437			No	None	Wire & Disc	75-75	All	None	35x4½	S.S.	Cord
Pilot	90	370		No		Yes	None	Wire & Disc	105			32x4	S.S.	Fabric
Porter 45				Berling	None	Yes	None	Wire	280	All	None	35x5	S.S.	Cord
Pullman	75		190		35		15					31x4		
Premier 6D	90	396	325	No		Yes	150	Wire & Disc	135-170	3	None	32x4½	S.S.	Cord
Reo T6	100	347			None	No					None	33x4	S.S.	Cord
Revere	85	384		Bosch	None	No		Wire	None	All	None	32x4½	S.S.	Cord
Roamer	90			Bosch	None	Yes	25	Wire & Disc	None—75	All	None	820x120	S.S.	Opt
Rock Falls	250			Bosch		No		Disc	150	All		35x5	S.S.	Cord
Saxon	75	276			45		25					32x4		
Sayers	90	350		Bosch	75	Yes	55	Wire & Disc	125-150	3	30	33x4	S.S.	Fabric
Scripps Booth		309		Bosch		Yes		Wire & Disc			Yes	880x120	S.S.	Fabric
Seneca L	65	280	148	Simms	35	Yes	10	Wire & Disc	85-75	5		30x3½	S.S.	Opt
Severin H	85	418		Bosch	None	Yes	None	None		5	None	32x4	S.S.	Fabric
Skelton	None			Simms	None	Yes		Wire			None		S.S.	Fabric
Stephens 6	90	410		Bosch	60	Yes	30	Wire	150	2		32x4	S.S.	Cord
Stevens-Duryea E	Yes			Berling		No		Wire	250	Yes	100	35x5	S.S.	Cord
Studebaker LS	Yes	266		Opt	Yes	Yes	Yes	Wire	Yes	2	None	815x105	S.S.	Opt
Studebaker BS	Yes	347		Opt	Yes	Yes	Yes	Wire	Yes			820x120	S.S.	Opt
Studebaker SS	Yes	331		Opt	Yes	Yes	Yes	Wire	Yes			815x105	S.S.	Opt
Stutz	125	444				Yes		Wire	None	2			S.S.	Cord
Templar	100	410	336	Simms		Yes		Wire	125	4		660x115	S.S.	Fabric
Velie 34	85	376	185	Splitdorf	45	Opt	None	Wire	105	2	None	32x3½	S.S.	Cord
Velie 38	85	376	185	Splitdorf	45	Opt	None	Wire & Disc	105-150	2	None	32x4	S.S.	Fabric
Vegue	100	360		Bosch	55	Yes		Wire & Disc	100-150	1		32x4	S.S.	Fabric
Willys-Knight 20	61	331	315	Bosch	50	Yes	None	Wire & Disc	50			33x4	S.S.	Fabric
Westcott C38	110	388		Bosch	100	Yes	None	Wire & Disc	125-150	2	50	33x4	S.S.	Cord
Westcott C48	110	413				No		Wire & Disc	175-200	2	50	33x4½	S.S.	Cord
Wasp 201				Bosch		No		Wire	None	All	None	33x5	S.S.	Cord
Winther 6	75	350		Bosch		Opt	150	Wire		All		33x4	S.S.	Cord
Winton 25	85			Bosch	75	Yes	75	Wire		All			S.S.	Cord

Imports of Passenger Cars for Nine Years

	1911	1912	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31 1918	Calendar Year 1919	Total for all years
Europe:											
Austria-Hungary	2 $13,000	2 $10,600	.....	2 $6,000	.....	.....	.....	.....	.....	.....	6 $29,600
Belgium	12 $33,335	8 $30,300	3 $11,000	12 $17,900	1 $1,436	.....	.....	.....	.....	.....	36 $93,971
France	140 $594,096	77 $317,075	14 $55,660	12 $41,735	2 $5,470	.....	1 $2,500	.....	.....	4 $10,468	250 $1,027,004
Germany	39 $160,942	36 $153,972	7 $21,557	5 $18,640	2 $7,100	.....	.....	.....	.....	.....	89 $362,211
Italy	15 $50,100	6 $25,500	4 $16,000	2 $4,500	6 $16,700	.....	.....	.....	.....	.....	33 $112,800
Netherlands	13 $49,620	4 $13,000	4 $9,000	1 $4,000	3 $9,530	.....	.....	.....	.....	.....	25 $85,150
Norway	.....	.....	.....	.....	1 $2,000	.....	.....	.....	.....	1 $4,000	2 $6,000
Russia in Europe	.....	.....	.....	1 $775	.....	.....	.....	.....	.....	.....	1 $775
Spain	.....	.....	.....	.....	1 $1,250	.....	1 $1,500	.....	.....	.....	2 $2,750
United Kingdom:											
England	307 $1,105,595	152 $547,162	67 $138,770	29 $75,777	22 $57,074	2 $5,774	1 $1,500	.....	1 $7,300	1 $1,460	582 $1,940,412
Scotland	2 $8,000	3 $7,000	.....	1 $1,200	9 $13,050	2 $6,120	.....	.....	.....	.....	17 $35,370
Ireland	1 $1,500	.....	.....	1 $720	.....	.....	.....	.....	.....	.....	2 $2,220
North America:											
Canada	126 $246,115	206 $427,901	266 $460,214	466 $848,219	295 $471,203	330 $465,100	1,000 $1,351,586	237 $288,904	162 $193,784	1,578 3,443,892	4,668 $8,196,918
Panama	2 $1,300	1 $800	1 $4,500	1 $900	2 $2,902	7	2 $10,220	2 $2,250	2 $1,550	12 $11,450	30 $35,872
Salvador	1 $3,000	1 $3,250	2 $3,300	1 $2,500	.....	.....	.....	.....	.....	.....	5 $12,050
Mexico	13 $40,151	13 $34,124	12 $30,940	7 $18,238	34 $38,751	50 $51,250	11 $8,530	14 $9,305	6 $5,900	19 $7,734	179 $244,923
Newfoundland & Labrador	.....	.....	1 $1,500	.....	.....	.....	.....	.....	.....	.....	1 $1,500
West Indies:											
Jamaica	20 $52,965	6 $24,050	2 $3,060	1 $1,500	1 $1,000	.....	2 $3,500	.....	.....	2 $3,333	34 $89,408
Other British	2 $3,450	.....	.....	.....	.....	.....	.....	.....	1 $125	4 $3,650	7 $7,225
Trinidad and Tobago	.....	.....	.....	.....	.....	1 $500	.....	.....	.....	.....	1 $500
Cuba	8 $18,150	10 $19,666	.....	2 $2,300	2 $1,709	10 $21,460	12 $19,582	7 $12,902	4 $15,600	29 $89,945	84 $201,314
Danish	.....	.....	.....	.....	.....	.....	1 $400	.....	.....	.....	1 $400
Dominican Republic	.....	.....	.....	.....	.....	.....	1 $500	.....	1 $1,400	.....	2 $1,900
Dutch West Indies	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 $1,500	1 $1,500
Haiti	.....	.....	.....	.....	.....	.....	.....	.....	1 $425	.....	1 $425
Virgin Islands of U. S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 $900	1 $900
South America:											
Argentina	3 $11,500	.....	.....	.....	.....	5 $19,000	.....	.....	.....	.....	8 $30,500
Brazil	3 $4,790	.....	.....	.....	1 $800	.....	.....	.....	.....	.....	4 $5,590
Colombia	1 $1,500	.....	.....	.....	.....	1 $2,660	.....	.....	.....	.....	2 $4,160
Peru	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 $6,235	1 $6,235
Venezuela	.....	.....	.....	.....	1 $750	.....	.....	.....	.....	.....	1 $750
Asia:											
British India	1 $5,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 $5,000
China	.....	.....	.....	1 $3,000	.....	.....	.....	.....	.....	.....	1 $3,000
Japan	.....	1 $4,000	1 $2,988	1 $600	.....	.....	.....	.....	.....	1 $1,500	4 $9,088
Oceania, French	.....	1 $750	.....	.....	1 $2,000	1 $600	.....	.....	.....	.....	3 $3,350
Philippine Islands	.....	.....	.....	1 $500	1 $1,000	1 $1,200	.....	.....	.....	1 $500	4 $3,200
Australia	.....	.....	.....	2 $5,491	1 $2,000	.....	.....	.....	.....	.....	3 $7,491
New Zealand	.....	.....	.....	.....	.....	.....	.....	.....	.....	1 $3,888	1 $3,888
Totals	711 $2,404,109	527 $1,619,150	384 $758,489	549 $1,054,495	386 $635,725	403 $573,664	1,037 $1,399,818	260 $313,361	178 $226,084	1,656 $3,590,455	6,091 $12,575,350

Trend in Truck Design as Revealed by 1921 Specifications

Thirty per cent increase in number of 2½ ton models. Marked tendency toward the four-speed gear box. Worm drive still predominates and shows a gain at expense of internal gear and chain drive. Disk clutch, vacuum fuel feed, pressed steel frame and block-cast cylinders gain in popularity.

By Herbert Chase

JUDGED by the number of models listed (and all figures given in this review refer to the number of models listed in tables compiled by CLASS JOURNAL publications) the most popular size of truck in 1921 is the 1½-ton, as was the case also in 1920. There has been an increase of about 14 per cent in the number of models of this size. The 2½-ton job is second in popularity, and the number of models of this size listed shows a 30 per cent increase. The 3½-ton is a close third in number of models, but the percentage gain in this size is only 17.

Among the outstanding tendencies revealed by the accompanying table and chart is that toward a more general use of the four-speed gearset. This tendency has been increasing rapidly since 1917-18, when it was given impetus by the design of war trucks which incorporated this feature and demonstrated its utility. Over 57 per cent of all models listed now have four-speed transmissions. The remaining models nearly all have three speeds, though there are a few which have two, five, or more than five gear changes.

Pneumatic tire equipment has become standard on trucks of one ton and less capacity and is increasing, at least as optional equipment on many larger sizes. The use of electric starting and lighting has increased slightly, its use being much more frequent on the light pneumatic tired trucks, but is not confined to this type.

The use of wood wheels still predominates, but the ratio of wood to metal is now less than 2 to 1, whereas last year it was over 3 to 1, indicating, of course, that the metal wheel is increasing in popularity.

Both the number and percentage of models using the worm gear final drive have increased at the expense of the internal gear and chain types. The bevel gear and double reduction types also show an increase, though the percentage of models using these types is not large.

The number of models of trucks in which the gearset is mounted amidship is almost the same as the number in which a unit powerplant is employed. Some regard the latter type as less accessible than the former, but the use of unit construction cuts down the number of parts required, so that there appears to be little choice between the two types. The practice of making the gearset a unit with the rear axle has been entirely abandoned.

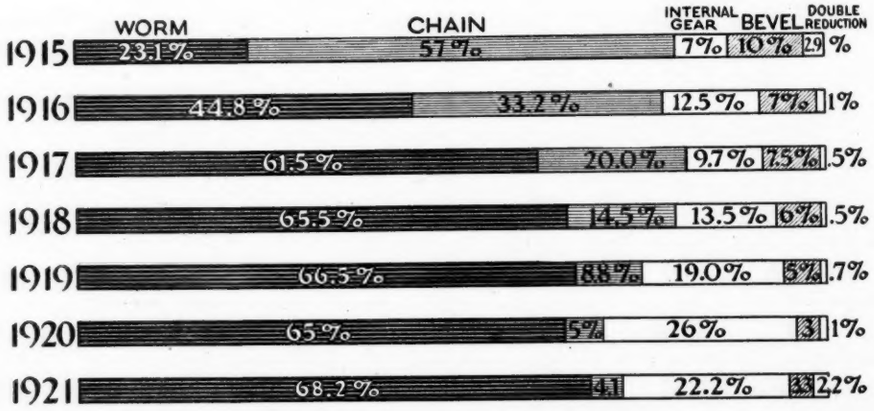
The cone clutch, which six years ago was used on more than 40 per cent of truck models, is now used by less than 6 per cent. The disk and plate types have become increasingly popular and are now used on over 94 per cent of the models listed, by far the majority of these using the multiple disk type. A large proportion of the latter run dry, fewer than formerly using the wet plate type.

Practice in respect to the engine type shows no very marked change. For many years past the four-cylinder engine has been used on over 95 per cent. of the models offered, and in 1921 it is employed in 99 per cent. There are still many advocates of pair-cast cylinders, over 28 per cent of the models listed using this type of construction, as against 69.7 per cent block-cast and 1.8 per cent separately cast. Block casting has shown a steady increase for many years, and the greater facility in machining and greater rigidity which this construction affords appears to be largely responsible for the increase.

Thermo-syphon cooling reached the height of its popularity in 1919 when it was employed on 24 per cent of the models. At present 16 per cent are using this system of cooling, while 84 per cent use pump circulation, which is more positive in action, while the higher water velocity enables the use of a smaller and lighter radiator.

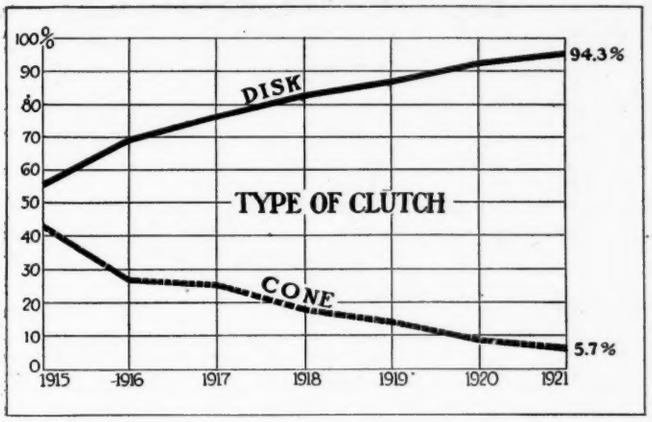
Gravity fuel feed systems have declined in popularity since 1919, when 79 per cent of models used this system. It is still the most used, with 64 per cent of the installations, but the use of vacuum feed is rapidly increasing and is now applied to 34.5 per cent of the models listed. Gravity feed will no doubt continue in the majority as long as space for a gravity tank can be provided, for the vacuum and pressure systems (the latter of which has almost disappeared) involves the use of elements which are not otherwise required.

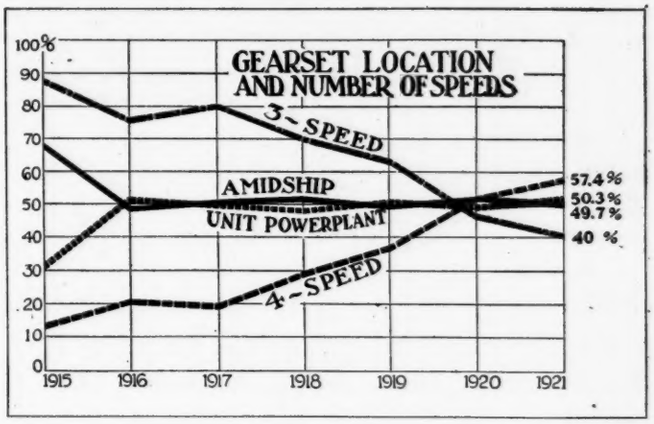
(*Continued on page* 348)

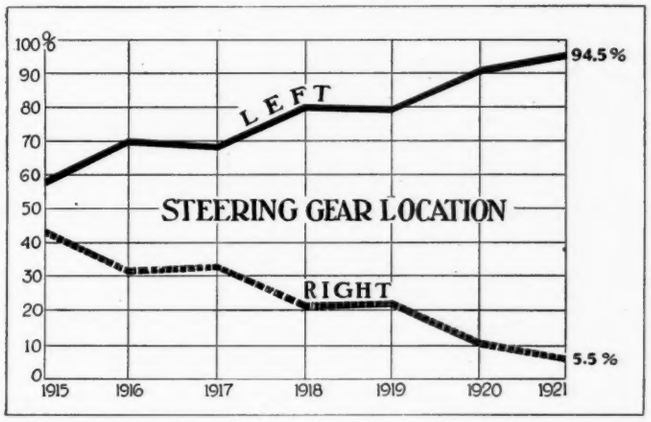


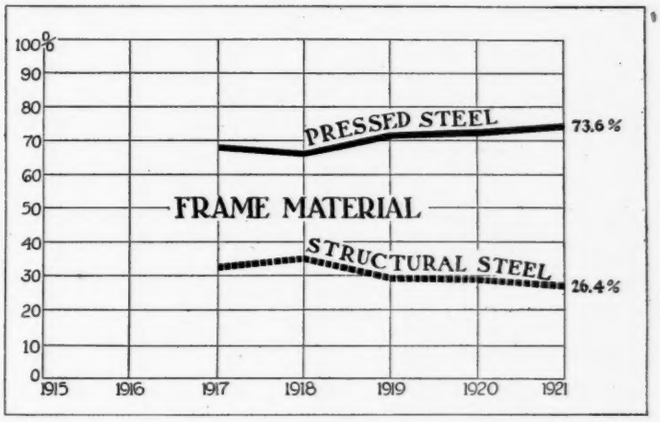
Trend of design with respect to final drive

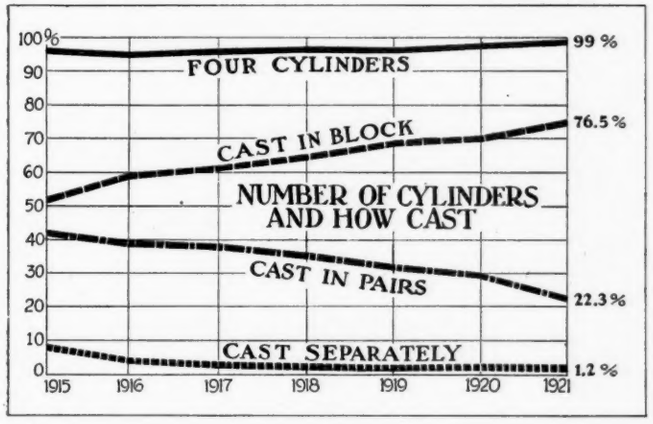
TENDENCIES IN TRUCK DESIGN FOR 1921

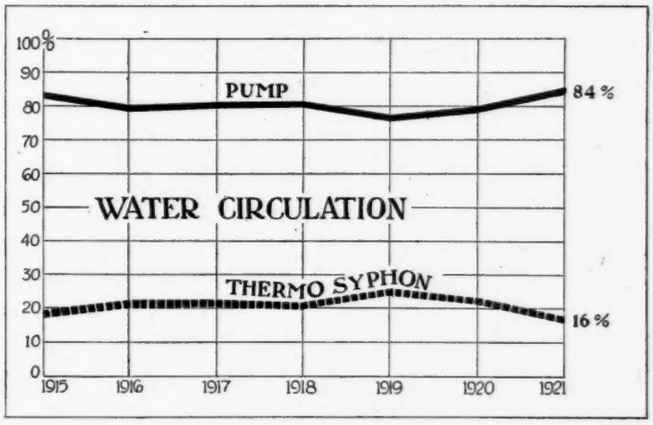


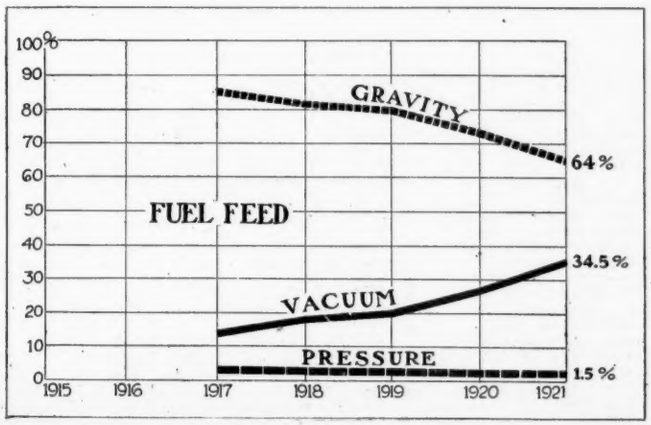


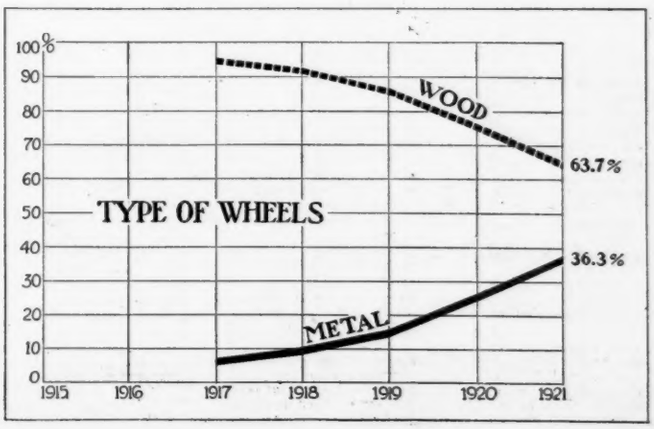












Specifications of

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME: Make	FRAME: Material	FRAME: Type	TIRES: Kind	TIRES: Size in Ins. Front	TIRES: Size in Ins. Rear	WHEELS: Make	WHEELS: Type	ENGINE: Make	ENGINE: No. Cyl, Bore and Stroke—N.A.C.C. Hp.	ENGINE: Cylinders Cast	COOLING: Water Circ.	COOLING: RADIATOR CASE Make	COOLING: RADIATOR CASE Type	COOLING: RADIATOR CORE Make	COOLING: RADIATOR CORE Type	IGNITION: Type	IGNITION: Make	IGNITION: Spark Advance	ELEC. SYSTEM: Type	ELEC. SYSTEM: Make	ELEC. SYSTEM: Extra Cost $
Acason.....H	2½	150	Savg..	p-stl..	s-flex..	sol*...	36x4	36x4d	Sth...	mt....	Wau..	4-43-8x5½-30.6	2	cent...	Natl..	est...	Natl..	cel....	sing...	Eismn.	hand..	lghtg..	Vesta.	50
Acason.....L	3½	180	Savg..	p-stl..	s-flex..	sol*...	36x5	36x5d	Sth...	mt....	Wau..	4-43-8x5½-30.6	2	cent...	Natl..	est...	Natl..	cel....	sing...	Eismn.	hand..	lghtg..	Vesta.	50
Acme.....G	¾	130	Savg..	p-stl..	s-flex..	pnu...	35x5	35x5	Bim...	wd*...	Cont..	4-3½x5 -22.5	4	ther...	G&O..	sht...	G&O..	cel....	sing...	Eismn.	hand..	lghtg..	G&D..	....
Acme.....B	1	130	Savg..	p-stl..	s-flex..	sol....	34x3½	34x5	Bim*..	wd....	Cont..	4-3½x5 -22.5	4	ther...	G&O..	sht...	G&O..	cel....	sing...	Eismn.	hand..	s&l...	G&D..	125
Acme.....F	1½	141	Savg*.	p-stl..	s-flex..	sol....	34x3½	34x5	Bim...	wd....	Cont..	4-3½x5 -22.5	4	cent...	own...	est...	G&O..	fin....	sing...	Eismn.	hand..	s&l...	Delco.	125
Acme.....A	2	148	P&B*..	p-stl..	s-flex..	sol....	36x4	36x7	Bim...	wd....	Cont..	4-4½x5½-27.2	4	cent...	own...	est...	G&O..	fin....	sing...	Eismn.	hand..	s&l...	Delco.	185
Acme.....C	3½	168	Smh*..	p-stl..	s-flex..	sol....	36x5	40x10	Bim...	wd....	Cont..	4-4½x5½-32.4	2	cent...	own...	est...	G&O..	fin....	sing ..	Eismn.	hand..	s&l...	Delco.	185
Acme.....E	5	180	Smh*..	p-stl..	s-flex..	sol....	36x6	40x12	Sth...	mt....	Cont..	4-4½x6 -36.1	2	cent...	own...	est...	G&O..	fin....	sing...	Eismn.	hand..	s&l...	Delco.	185
Akron Multi-Truck...20	1	133	Hyd..	p-stl..	flex...	pnu...	34x5	34x5	Bim...	wd....	Hink..	4-4 x5½-25.6	4	cent...	Fed...	prs...	Fed...	cel....	sing...	West..	hand..	sl&i..	West..	....
American.....25	2½	158	Shar...	p-stl..	rigid..	sol*...	36x4	36x4d	Sth...	mt....	Wsc...	4-4 x6 -25.6	4	cent...	G&O..	est...	G&O..	fin....	sing...	Eismn.	auto..	opt....	.....	....
American.....40	4	158	Detrt..	p-stl..	rigid..	sol*...	36x5	36x5d	Sth...	mt....	Wsc...	4-4½x6 -32.4	4	cent...	G&O..	est...	G&O..	fin....	sing...	Eismn.	auto..	opt....	.....	....
Armleder.....20	1	148	Smh..	p-stl..	flex...	sol*...	34x3½	34x5	Crn...	wd....	Buda..	4-3½x5½-22.5	4	cent...	own...	est...	Long..	fin....	sing...	Bosch.	hand..	s&l-2..	West..	....
Armleder.....HW	2½	148	Smh..	p-stl..	flex...	sol*...	36x4	36x7	Crn...	wd....	Buda*.	4-4½x5½*-28.9*	4	cent...	Long..	est...	Long..	fin....	sing...	Bosch.	hand..	s&l-2..	West..	....
Armleder.....KW	3½	156	own...	rol-I..	s-flex..	sol....	36x5	36x5d	Crn...	wd....	Buda*.	4-4½x6* -32.4*	4	cent...	own...	est...	Long..	fin....	sing...	Bosch.	hand..	s&l-2..	West..	....
Atco.....B	1½	132	own...	rol-c..	s-flex..	pnu*..	34x5	36x6	Sth...	mt....	Buda .	4-3½x5½-22.5	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Eismn.	hand..	s&l-2.	West..	150
Atco.....B1	1½	132	own...	rol-c..	s-flex..	pnu ..	34x5	36x6	Stn...	wd....	Buda..	4-3½x5½-22.5	4	cent...	Chgo.	est...	Chgo.	fin....	sing...	Eismn.	hand..	s&l-2.	West..	150
Atco.....A	2½	150	P&B..	p-stl..	s-flex..	sol*...	36x4	36x8	Sth...	mt....	Buda..	4-4½x5½-28.9	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Eismn.	hand..	lghtg..	Eismn.	100
Atlas (York) Dispatch 21	1	130	Prsh..	p-stl..	s-flex..	pnu...	32x4½	32x4½	E&O..	wd....	Lyc...	4-3½x5 -19.6	4	ther...	Jstn...	.....	Jstn...	cel....	sing...	A-Knt	hand..	sl&i...	Bijur..	none
Atterbury.....20R	1½	144	Savg..	p-stl..	flex...	sol....	34x3½	34x5	Arch..	wd....	Cont..	4-3½x5 -22.5	4	cent...	own...	est...	Lng...	fin....	sing...	Berlg..	fixed..	lghtg	Delco.	none
Atterbury.....7CX	2½	153	Savg..	p-stl..	flex...	sol....	36x4	36x4d	Arch..	wd....	Cont..	4-4½x5½-27.2	4	cent...	own...	est...	Lng...	fin....	sing...	Berlg..	fixed.	none.	.....	....
Atterbury.....7D	3½	167	Savg..	p-stl..	flex...	sol....	36x5	40x5d	Arch..	wd....	Cont..	4-4½x5½-32.4	2	cent...	own...	est...	Lng...	fin....	sing...	Berlg..	hand..	none.	.....	....
Atterbury.....8E	5	167	Savg..	p-stl..	flex...	sol....	36x5	40x6d	Stn...	mt....	Cont..	4-4½x6 -36.1	2	cent...	own...	est...	Lng...	fin....	sing...	Berlg..	hand..	lghtg..	Delco.	none
Autocar.....XXI-UF	2	97	own...	p-stl..	s-flex..	sol*...	34x4	34x5	H&D..	wd....	own...	2-4½x4½-18.1	1	cent...	own...	sht...	own...	fin....	sing...	Bosch.	fixed..	none.	.....	....
Autocar.....XXI-UG	2	120	own...	p-stl..	s-flex..	opt...	34x4	34x5	H&D..	wd....	own...	2-4½x4½-18.1	1	cent...	own...	sht...	own...	fin....	sing...	Bosch.	fixed..	none.	.....	....
Autocar.....XXVI-Y	3½	120	own...	p-stl..	s-flex..	sol....	34x5	36x10	H&D..	wd....	own...	4-4½x5½-28.9	4	cent...	own...	est...	G&O..	fin....	sing...	Bosch.	hand..	none.	.....	....
Autocar.....XXVI-B	3½	156	own...	p-stl..	s-flex..	sol....	34x5	36x10	H&D..	wd....	own...	4-4½x5½-28.9	4	cent...	own...	est...	G&O..	fin....	sing...	Bosch.	hand..	none.	.....	....
Available.....H-1½	1½	145	own...	rol-c..	s-flex..	sol*...	36x3½	36x5	Crn...	wd....	Her...	4-4 x5½-25.6	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Bosch.	hand..	lghtg.	West..	150
Available.....H-2½	2½	152	own...	rol-c..	s-flex..	sol*...	36x4	36x8	Crn...	wd....	Her...	4-4 x5½-25.6	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Bosch.	hand..	lghtg.	West..	150
Available.....H-3½	3½	176	own...	rol-c..	s-flex..	sol*...	36x5	40x5d	Crn...	wd....	Her...	4-4½x5½-32.4	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Bosch.	hand..	lghtg.	West..	150
Available.....H-5	5	190	own...	rol-c..	s-flex..	sol....	36x6	40x12	Sth...	mt....	Her...	4-4½x6 -36.1	2	cent...	Chgo..	est...	Chgo..	fin....	sing...	Bosch.	hand..	lghtg.	West..	150
Available.....H-7	7	190	own...	rol-c..	s-flex..	sol....	36x6	40x14	Sth...	mt....	Her...	4-5 x6 -40.0	2	cent...	Chgo..	est...	Chgo..	fin....	sing...	Bosch.	hand..	lghtg.	West..	150
Avery.....	1	129	own...	p-stl..	rigid..	pnu...	34x5	34x5	own...	wd....	own...	6-3 x4 -21.6	6	ther...	own...	est...	Pfx..	cel....	sing...	K-W..	hand..	sl&i..	West..	none
Bell.....E	1½	136	own...	rol-c..	rigid..	sol....	34x3½	34x5	Bim...	wd....	Buda..	4-3½x5½-16.9	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Eismn.	hand..	.....	none..	100
Bell.....O	2½	156	own...	rol-c..	rigid..	sol....	34x4	34x7	Bim...	wd....	Buda .	4-4½x5½-28.9	4	cent...	Chgo.	est...	Chgo..	fin....	sing...	Eismn.	hand..	.....	none..	100
Bessemer.....G	1	124	P&B..	p-stl..	flex...	pnu...	35x5	35x5	Way..	wd....	Cont..	4-3½x5 -29.4	4	ther...	own...	est...	Stn...	cel....	sing...	Bosch.	hand..	.....	Eismn.	....
Bessemer.....H2	1½	144	P&B..	p-stl..	flex...	sol....	36x3½	36x5	Way..	wd....	Cont..	4-3½x5 -22.5	4	ther...	own...	est...	Stn...	cel....	sing...	Bosch.	hand..	.....	Eismn.	....
Bessemer.....J2	2½	156	P&B..	p-stl..	flex...	sol....	36x4	36x4	Way..	wd....	Cont..	4-4½x5½-27.2	4	cent...	own...	est...	Stn...	cel....	sing...	Bosch.	hand..	.....	Eismn.	....
Bessemer.....K2	4	175	Pgh...	p-stl..	flex...	sol....	36x6	36x10	Sth...	mt....	Cont..	4-4½x5½-32.4	4	cent...	own...	est...	.....	.....	sing...	Bosch.	hand..	.....	none..	....
Bethlehem.....K	1	125	Drt...	p-stl..	flex...	pnu...	34x4½	35x5	Way..	wd....	own...	4-3½x5 -19.6	4	ther...	H&K..	prs...	Lvgn..	cel....	sing...	Bosch.	hand..	s&l-2..	G&D..	none
Bethlehem.....G	2	135	Drt...	p-stl..	flex...	sol*...	34x3½	34x6	Way..	wd....	own...	4-4 x5½-25.6	4	ther...	own...	est...	Lvgn..	cel....	sing...	Bosch.	hand..	s&l-2..	G&D..	none
Bethlehem.....H	3	143	Drt...	p-stl..	flex...	sol*...	36x4	36x8	Sth...	mt....	own...	4-4 x5½-25.6	4	ther...	own...	est...	Lvgn..	cel....	sing...	Bosch.	hand..	s&l-2..	G&D..	none
Bethlehem.....J	4	162	Drt...	p-stl..	flex...	sol*...	36x5	36x5d	Sth...	mt....	own...	4-4½x5½-32.4	4	ther...	own...	est...	Lvgn..	cel....	sing...	Bosch.	hand..	s&l-2..	G&D..	none
Bollstrom.....B-21	4	140	own...	r-stl..	s-flex..	sol....	36x7	36x7	Clrk..	mt....	Hink..	4-4½x5½-32.4	4	cent...	own...	est...	Lng...	tube..	sing..	Eismn.	hand..	s&l...	Rem..	80
Bollstrom.....A-20	4	135	own...	rol-c..	rigid..	pnu...	40x8	40x8	Clrk..	mt....	Wsc...	4-5½x7 -52.9	2	cent...	own...	est...	Lng...	fin....	dual..	Eismn.	hand..	s&l...	L-N..	....
Bollstrom.....30	1½	140	own...	p-stl..	s-flex..	sol....	34x3½	34x6	own...	mtl...	Buda..	4-3½x5½-22.5	4	cent...	own...	est...	.....	fin....	sing...	Eismn.	hand..	s&l-2..	G&D..	150
Bollstrom.....50	2½	150	own...	p-stl..	s-flex..	sol....	36x4	36x8	own...	mtl...	Buda..	4-4½x5½-29.0	4	cent...	own...	est...	.....	fin....	sing...	Eismn.	hand..	s&l-2..	G&D..	150
Bollstrom.....70	3½	160	own...	p-stl..	s-flex..	sol....	36x5	36x10	own...	mtl...	Buda..	4-4½x6 -32.4	4	cent...	own...	est...	.....	fin....	sing...	Eismn.	hand..	s&l-2..	G&D..	150
Bridgeport.....A	1½	144	own...	rol-c..	flex...	sol*...	34x3	34x6	Arch..	wd....	Buda..	4-3½x5½-22.5	4	cent...	Chgo..	est...	Chgo..	fin....	sing...	Eismn.	hand..	.....	.....	....
Bridgeport.....B	2½	156	own...	rol-c..	flex...	sol*...	36x4	36x7	Arch..	wd....	Buda..	4-4½x5½-28.9	4	cent...	own...	est...	G&O..	cel....	sing...	Eismn.	hand..	none.	.....	....
Bridgeport.....C	4	170	own...	p-stl..	.....	sol....	36x5	36x5d	Arch..	wd....	Buda..	4-4½x6 -32.4	4	cent...	own...	est...	G&O..	cel....	sing...	Eismn.	hand..	none.	.....	....
Bridgeport.....D	6	172	own...	p-stl..	.....	sol....	36x6	36x6d	Arch..	wd....	Buda..	4-4½x6 -32.4	4	cent...	own...	est...	G&O..	cel....	sing...	Eismn.	hand..	.....	.....	....
Brinton.....F	2½	150	own...	rol-c..	rigid..	sol....	36x4	36x7	Sth...	mtl...	Cont..	4-4½x5½-27.2	4	g-p...	Chgo..	est...	Chgo..	tube..	sing..	Bosch.	fixed..	none.	.....	....
Brockway.....S4	1½	140	own...	p-stl..	s-flex..	opt...	36x3½	36x5	H&D..	wd....	Cont..	4-3½x5 -22.5	4	cent...	Bush..	est...	Bush..	fin....	sing...	Eismn.	hand..	s&l...	Dneto.	....
Brockway.....K5	2½	152	own...	p-stl..	s-flex..	sol....	36x4	36x7	H&D..	wd....	Cont..	4-4½x5½-27.2	4	cent...	Bush..	est...	Bush..	fin....	sing...	Eismn.	hand..	.....	Dneto.	....
Brockway.....R4	3½	164	own...	p-stl..	s-flex..	sol....	36x5	36x5d	Sth...	mt....	Cont..	4-4½x5½-32.4	2	cent...	Bush..	est...	Bush..	fin....	sing...	Eismn.	hand..	s&l...	Dneto.	....
Brockway.....T	5	174	own...	p-stl..	s-flex..	sol....	36x6	40x6d	Sth...	mt....	Cont..	4-4½x6 -36.1	2	cent...	Long..	est...	Long..	fin....	sing...	Eismn.	hand..	s&l...	none..	....
Capitol.....G1½	1½	144	own...	rol-c..	s-flex..	pnu...	35x5	38x7	Ames.	wd....	Wsc...	4-3½x5 -22.5	4	cent...	G&O..	est...	G&O..	fin....	sing...	Eismn.	hand..	sl&i-2.	West..	none
Capitol.....H2½	2½	156	own...	rol-c..	s-flex..	sol....	36x4	36x8	.....	wd....	Wsc...	4-4½x6 -28.9	4	cent...	G&O..	est...	G&O..	fin....	sing...	Bosch.	hand..	none.	.....	....
Capitol.....K2½	2½	156	own...	rol-c..	s-flex..	pnu...	36x6	42x9	.....	wd....	Wsc...	4-4½x6 -28.9	4	cent...	G&O..	est...	G&O..	fin....	sing...	Bosch.	hand..	sl&i-2.	West..	none
Capitol.....M3½	3½	168	own...	rol-c..	s-flex..	sol....	36x5	36x10	Sth...	mt....	Wsc...	4-4½x6 -28.9	4	cent...	G&O..	est...	G&O..	fin....	sing...	Bosch.	hand..	sl&i-2.	West..	170
Chevrolet.....G	¾	120	own...	p-stl..	rigid..	pnu...	31x4	34x4½	own...	wd....	own...	4-3 1/16x4-22 5	4	cent...	Har...	prs...	Har...	cel....	dbl..	Remy.	hand..	sl&i-2.	Aut-L	....
Chevrolet.....T	1	125	own...	rol-c..	rigid..	pnu...	33x4	35x5	own...	wd....	own...	4-3 1/16x5½-22.5	4	cent...	Har...	prs...	Har...	cel....	dbl..	Remy.	hand..	sl&i-2.	Aut-L.	....
Chicago.....C1½	1½	144	own...	rol-c..	flex...	sol*...	36x3½	36x5	Stn...	wd....	Her...	4-3½x5½-22.5	4	cent...	own...	est...	Brem	fin....	sing...	Bosch.	fixed..	.....	.....	....
Chicago.....C2½	2½	156	own...	rol-c..	s-flex..	sol*...	36x4	36x7	.....	cst....	Her...	4-4 x5½-25.6	4	cent...	own...	est...	Brem	fin....	sing...	Bosch.	fixed..	.....	.....	....

ABBREVIATIONS—Types of Construction

•—other options
amid—amidships
auto—automatic
bevl—bevel
cel—cellular
cent—centrifugal
chn—chain
est—cast
ctr—center
cylinders cast, 2 in pairs
cylinders cast, 4 in block
cylinders cast, 3 in threes
cylinders cast, 1 singly
cyl-ends—cylinder-ends
d—dual
d-d—dry-disk
d-p—dry-plate
dplx—from both motor & driveshaft
d-rd—double reduction
d-s—drive-shaft
elec—electric
ext-d-s—external drive-shaft
ext-f-w—external front wheel
ext-g—external gear
ext-jst — external jack-shaft
ext-r-w—external rear wheel
fab—fabric
fin—finned tube
flex—flexible
f-m—fabric & metal
fric—friction
g-p—gear pump
grv—gravity
gset—from gearset
hyd—hydraulic
ind-c—individual clutch
int-g—internal gear
int-g-4 — internal gear drive on 4 wheels
int-r-w—internal rear wheel
jst—unit with jackshaft
l—left
l-b—loose ball
lghtg—lighting only
mtr—unit with motor
mt—metal (wheels)
mtl—metal (universal joint)
opt—optional
pist—piston pump
plan—planetary
pin—plain tube
pnu—pneumatic
pres—pressure
prog—progressive
prs—pressed steel
p&s—pneumatics in front solids in rear
p-stl—pressed steel
r—right
r&c—right & center
r-rd—radius rods
rol-c—rolled channel
rol-i—rolled I-beam
selec—selective
s-flex—semi-flexible
s-fr—sub-frame
sht—sheet
s&l—starting & lighting
sl&i-2—starting, lighting & ignition, 2 unit
sol—solid
sprgs—springs
sq-t—square tube
start—starting only
suct—suction
t-arm—torque arm
ther—thermo-syphon
t-p—two-point
t-t—torsion tube
vac—vacuum
wat-tube—water tube
wd—wood
w-d—multiple disk in oil
w-p—plate in oil
wr—wire
zz-t—zig-zag tube

ABBREVIATIONS—Makers of Parts.

•Other Options
A-Knt—Atwater-Kent
Al-Ch—Allis-Chalmers
Amer — American Magneto Co.
Arch—Archibald
Aut-L—Auto-Lite
Auto—Auto Wheel Co.
B-Beck—Borg & Beck
BCA—Bearings Co. of Am.
Berlg—Berling
Bim—Bimel
Bl&Fl—Blood & Flexite
B-Lipe—Brown-Lipe
Blood—Blood Bros.
Bl&P—Blood & Peters
Bl&Sp—Blood & Spicer
B-M—Bucyrus Mach. Tool
Brem—Bremer
Cart—Carter carburetor
Cas—G. M. Castle
CAS—C. A. S. products
C-D—Curran-Detroit Radiator Co.
Chgo—Chicago Mfg. Co.
Chic—Chicago Standard
Chmp—Champion Auto Spring Co.
Clrk—Clark Equip. Co.
Coen—Corcoran Radiator Co.
Col—Columbia Axle Co.
Cont—Continental motor
Conn—Connecticut
Crn—Crane & MacMahon
Crn-S—Crane & MacMahon and Standard
Day—Dayton wheel
Detlaf—Detlaff
Det — Detroit Wheel & Rim
Detrt—Detroit G. & M.
Ditl—Disteel Wheel Co.
Ditw—Ditwiler Mfg. Co.
Dnet—Dyneto

Gasoline Trucks

ENGINE									TRANSMISSION										Springs Make	BRAKES		CONTROL			UNIVERSALS		Name and Model
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE		Total Gear Reduction	Propulsion Taken By	Torque Taken By			Foot	Hand	STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make								Placed	Make	Levers	Type	Make	
cent..	Wau...	motor.	1200	18	Schblr..	vac..	d-d...	Detlaf..	ind-c..	Cotta..	amid..	4	worm.	Timkn	7.75	sprgs..	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acason	H
cent..	Wau...	motor.	1200	14	Schblr..	vac..	d-d...	Detlaf..	ind-c..	Cotta..	amid..	4	worm.	Timkn	8.75	sprgs..	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acason	L
none..	.....	.....	1700	30	Rayfld.	vac..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	3	worm.	Timkn	6.25	sprgs..	sprgs..	Drt...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	
cent..	Dplx..	gset..	1700	22	Rayfld.	vac..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	3	worm.	Timkn	7.20	sprgs..	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	B
cent..	Dplx..	gset..	1500	19	Zenith..	vac..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	3	worm.	Timkn	8.75	sprgs..	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	F
cent..	Dplx..	gset..	1500	17	Rayfld.	vac..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	4	worm.	Timkn	9.25	sprgs..	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	A
cent..	Dplx..	motor.	1200	13	Rayfld.	vac..	d-p...	B-Beck.	ind-c..	Cotta..	amid..	4	worm.	Timkn	10.33	r-rd...	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	C
cent..	Cont ..	motor.	1250	12	Rayfld.	vac..	d-p...	B-Beck.	ind-c..	Cotta..	amid.	4	worm.	Timkn	11.66	r-rd...	sprgs..	Dtr...	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Blood..	Acme	E
.....	.....	.....	1509	30	Stmbg..	grv..	d-d...	War...	selec..	Warner.	mtr...	3	bevl..	Eaton.	5.12½	sprgs..	sprgs..	Stn...	int-. ...	int-r-w.	l....	Jacox	ctr..	fab	.....	Akron Multi-Truck	20
suct..	own...	motor.	1600	18	Stmbg..	grv..	d-d...	Detlaf..	selec..	Covert.	mtr...	4	worm.	Thorn.	8.66	sprgs..	sprgs..	Sp-P..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Acme..	American	25
snct..	Pierce..	motor.	1600	15	Stmbg..	grv..	d-d...	Cotta..	selec..	Covert.	amid..	4	worm.	Wis...	10.00	sprgs..	sprgs..	Sp-P..	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	Acme..	American	40
none..	.....	.....	.....	....	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	7.25	r-rd...	sprgs..	Math.	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Armleder	20
none..	.....	.....	.....	....	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	9.25	r-rd...	sprgs..	Math.	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Armleder	HW
none	.....	.....	.....	....	Zenith.	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	10.3	r-rd...	sprgs..	Math.	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Armleder	KW
none..	.....	.....	1200	20	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis*.	7.25	sprgs..	sprgs.	GCS..	int-r-w.	int-r-w.	l....	Ross..	ctr..	fab	Therm.	Atco	B
none..	.....	.....	1200	20	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Torbn.	7.00	sprgs..	sprgs.	GCS...	ext-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	.....	Atco	B1
cent..	Pierce..	motor.	1200	16	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Wis...	8.67	sprgs..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Hart...	Atco	A
none..	.....	.....	.....	....	Marvl..	grv..	d-p...	B-Beck.	selec..	own....	mtr...	3	worm.	own..	.....	.....	sprgs.	Iron..	ext-r-w.	ext-d-s.	l....	C.A.S.	ctr..	mtl	Sterl...	Atlas (York) Dispatch	21
cent..	Simp..	motor.	1525	20	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	7.75	sprgs..	sprgs.	Sp-p..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Atterbury	20R
suct..	Mnrch.	.....	1300	16	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.50	sprgs..	sprgs.	Sp-p..	int-r-w.	int-r-w.	r....	Gem..	r...	mtl	Spicer..	Atterbury	7CX
suct..	Mnrch.	.....	1200	14	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	10.33	sprgs..	sprgs.	Sp-p..	int-r-w.	int-r-w.	r....	Gem..	r...	mtl	Spicer..	Atterbury	7D
suct..	Cont..	motor.	1100	12	Zenith..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Timkn	11.66	r-rd...	sprgs.	Sp-p..	int-r-w.	int-r-w.	l....	Gem..	ctr.	mtl	Spicer..	Atterbury	8E
none..	.....	.....	.....	....	Stmbg..	grv..	d-p...	own....	prog..	own....	amid..	3	d-rd...	own..	8.30	sprgs.	sprgs.	Rowl*	ext-r-w.	int-r-w.	l....	own..	r...	mtl	Spicer..	Autocar	XXI-UF
none..	.....	.....	.....	....	Stmbg..	grv..	d-p...	own....	prog..	own....	amid.	3	d-rd...	own..	8.30	sprgs.	sprgs.	Rowl*	ext-r-w.	int-r-w.	r....	own..	r...	mtl	Spicer..	Autocar	XXI-UG
cent..	Dplx..	motor.	1800	16	Stmbg..	grv..	d-p...	own....	selec..	own....	amid..	4	d-rd...	own..	8.70	sprgs.	sprgs.	Rowl*	int-r-w.	int-r-w.	r....	Ross..	ctr..	mtl	Sp&Sn.	Autocar	XXVI-Y
cent..	Dplx..	motor.	1800	16	Stmbg..	grv..	d-p...	own....	selec..	own....	amid..	4	d-rd...	own..	8.70	sprgs.	sprgs.	Rowl*	int-r-w.	int-r-w.	l....	Ross..	ctr..	f-m	Sp&Sn.	Autocar	XXVI-B
cent..	Pierce..	motor.	1175	18	Stmbg..	vac..	d-d...	B-Lipe.	ind-c..	Cotta..	amid..	4	worm.	Timkn	7.25	r-rd...	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	M&E..	Available	H-1½
cent..	Pierce..	motor.	1155	16	Stmbg..	vac..	d-d...	B-Lipe.	ind-c..	Cotta..	amid..	4	worm.	Timkn	7.50	r-rd...	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	M&E..	Available	H-2½
cent..	Pierce..	motor.	1130	13	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.33	r-rd'.	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	M&E..	Available	H-3½
cent..	Pierce..	motor.	1175	12	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	11.66	r-rd...	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	M&E..	Available	H-5
cent..	Pierce..	motor.	1175	10	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	bevel..	Savg..	14.00	r-rd...	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	M&E..	Available	H-7
cent..	own...	motor.	1400	20	Stmbg..	vac..	d-d...	own....	selec..	own....	amid..	3	int-g..	Torbn.	.....	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	own....	Avery	
none..	.....	.....	1200	15	Stmbg..	vac..	d-p...	B-Beck.	selec..	Detrt..	mtr...	3	int-g..	Russl..	.....	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Gem..	ctr..	mtl	Unvsl..	Bell	E
cent..	Dplx..	motor.	1100	18	Stmbg..	vac..	d-p...	B-Beck.	selec..	Detrt..	mtr...	3	int-g..	Russl..	.....	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Gem..	ctr..	mtl	Unvsl..	Bell	O
none..	.....	.....	.....	20	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Torbn.	8.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Arvac..	Bessemer	G
cent..	none..	motor.	.....	18	Stmbg..	grv..	d-p...	B-Beck.	selec..	Baker..	amid..	3	int-g..	Torbn.	8.00	r-rd...	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Ross..	ctr..	mtl	Arvac..	Bessemer	H2
cent..	Pierce..	motor.	1220	16	Stmbg..	grv..	d-p...	B-Beck.	selec..	Baker..	amid..	4	int-g..	Torbn.	12.00	r-rd...	sprgs.	S-P...	ext-r-w	int-r w.	l....	Ross..	ctr..	mtl	Arvac..	Bessemer	J2
cent..	Pierce..	motor.	1250	13	Stmbg..	grv..	d-p...	B-Beck.	selec..	Baker..	amid..	4	int-g..	Torbn.	10.25	r-rd...	sprgs.	S-P...	ext-r-w	ext-d-s.	l....	Ross..	ctr..	mtl	Arvac..	Bessemer	K2
none..	.....	.....	2400	47	Zenith..	grv..	d-p...	B-Beck.	selec..	Drt....	mtr...	3	int-g..	Col...	6.80	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Bethlehem	K
cent..	Pierce..	motor.	1200	19	Zenith..	grv..	d-p...	B-Beck.	selec..	Drt....	mtr...	3	int-g..	Russl..	7.70	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Lavn..	ctr..	mtl	Unvsl..	Bethlehem	G
cent..	Pierce..	motor.	1200	16	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Russl..	9.40	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Lavn..	ctr..	mtl	Unvsl..	Bethlehem	H
cent..	Pierce..	motor.	1200	14	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g..	Torbn.	10.20	sprgs.	sprgs.	Math.	int-r-w	ext-d-s.	l....	Lavn..	ctr..	mtl	Unvsl..	Bethlehem	J
cent..	Hink..	motor.	1200	19	Stmbg..	grv..	d-d...	Detlaf..	selec..	own....	amid..	8	int-g..	Clrk..	6.50	sprgs.	sprgs.	Drt...	ext-r-w	i&e-f&r.	l....	Jacox	ctr..	mtl	own....	Bollstrom	B-21
none..	.....	.....	1400	28	Stmbg..	grv.	w-d...	M&E..	selec..	Cotta..	amid..	8	int-g..	Clrk..	5.76	sprgs.	sprgs.	Drt...	ext-r-w	i&e-f&r.	l....	Wol...	ctr..	mtl	M&E..	Bollstrom	A-20
cent..	.....	motor.	1400	20	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	own...	7.00	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	.....	ctr..	mtl	own....	Bollstrom	30
cent..	.....	motor.	1300	17	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	own...	7.75	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	.....	ctr..	mtl	own....	Bollstrom	50
cent..	.....	motor.	1200	14	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	own...	9.00	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	.....	ctr..	mtl	own....	Bollstrom	70
cent..	Pierce..	motor.	1250	38	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	3	worm.	Wis...	.....	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Hart...	Bridgeport	A
cent..	Pierce..	motor.	1250	13	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	4	worm.	Shel..	.....	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	l...	mtl	Hart...	Bridgeport	B
cent..	Pierce..	motor.	1250	13	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	amid..	4	worm.	Wis...	.....	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Hart...	Bridgeport	C
cent..	Pierce..	motor.	1250	..	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	amid..	4	worm.	S-P...	.....	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Hart...	Bridgeport	D
cent..	Pierce..	motor.	1200	18	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	r-rd...	sprgs.	Tuth..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Brinton	F
hyd..	Pharo..	motor.	1260	18	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel..	7.80	r-rd...	sprgs.	Shel..	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Spicer..	Brockway	S4
hyd..	Pharo.	motor.	1100	15	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Timkn	7.75	r-rd...	sprgs.	Shel..	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Spicer..	Brockway	K5
hyd..	Pharo.	motor.	1150	14	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	8.75	r-rd...	sprgs.	Shel..	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Spicer..	Brockway	R4
hyd..	Pharo..	motor.	1100	12	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.75	r-rd...	sprgs.	Shel..	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Spicer..	Brockway	T
cent..	Dplx..	motor.	1300	24	Stmbg..	grv..	d-d...	Detlaf..	ind-c..	Cotta..	mtr...	4	worm.	Wis...	6.20	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Capitol	G1½
cent..	Dplx..	motor.	1150	14	Stmbg..	grv..	d-d...	Detlaf..	ind-c..	Cotta..	mtr...	4	worm.	Wis...	8.66	sprgs.	sprgs.	Sp-P	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Capitol	H2½
cent..	Dplx..	motor.	1150	20	Stmbg..	grv..	d-d...	Detlaf	ind-c..	Cotta..	mtr...	4	worm.	Wis...	7.25	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Capitol	K2½
cent..	Dplx..	motor.	1150	14	Stmbg..	grv..	d-d...	Detlaf..	ind-c..	Cotta..	mtr...	4	worm.	Wis...	9.00	sprgs.	sprgs.	Sp-P..	int-r-w	int-r-w.	l....	Ross..	ctr..	mtl	Spicer..	Capitol	M3½
.....	.....	.....	.....	....	Zenith..	grv..	cone..	.....	selec..	.....	mtr...	3	bevel..	.....	6.33	sprgs.	sprgs.	own..	int-r-w	int-r-w.	l....	own..	ctr..	mtl	own....	Chevrolet	G
.....	Murch.	.....	.....	25	Zenith..	grv..	cone..	own....	selec..	own....	mtr...	3	worm.	own.	7.00	sprgs.	sprgs.	own..	int-r-w	int-r-w.	l....	own..	ctr..	mtl	Own...	Chevrolet	T
cent..	Simp..	motor.	1150	18	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	7.75	sprgs.	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Peters.	Chicago	C1½
cent..	Simp..	motor.	1150	16	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.50	sprgs.	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem..	ctr..	mtl	Peters.	Chicago	C2½

ABBREVIATIONS—Makers of Parts—(Con)—

Dplx—Duplex governor
Drt—Detroit Pressed Steel Co.
Dtr—Detroit Products
Dtrt—Detroit lubricator
Dun—Dunbar Mfg. Co.
Dund—Dundore Mfg. Co.
Dunk—Dunkirk Axle Corp.
Dur—Durston Gear Corp.
Elyr—Elyria Steel Products Co.
E&M—English & Mersick
E&O—Eberly & Orris
Eismn—Eisemann
Ens—Ensign carburetor
Eric—Ericsson Mfg. Co.
Eurk—Eureka
Fed—Fedders
GB&S—Golden, Belknap & Schwartz
G&D—Gray & Davis
G&O—G & O Mfg. Co.
GCS—Garden City springs
Gem—Gemmer
G-Lees—Grant-Lees
Godn—Gordan Radiator Co.
Har—Harrison
Hart—Hartford
Harv—Harvey
Hay—Hayes Wheel Co.
H&D—Hoopes Bros. & Darlington
H&K—Hale & Kilburn
Her—Hercules
Hghy—Highway Engine Co.
Hink—Hinkley
H-Shaw—Hele-Shaw
H-S—Herschell-Spillman
Hyd—Hydraulic
Idl—Ideal
Int—Intersfate
Iron—Iron City
Jacox—Jackson-Church-Wilcox
Jck—Jackson Auto Rad.
Jmst—Jamestown Car Parts
Jns—Phineas Jones & Co.
John—Johnson Co.
K&B—Kinsler & Bennet
Kel—Kelsey Wheel Co.
Kug—Kueng Radiator Co.
K.W.—K.W. Ignition Co.
Laur—Lauraine Magneto
Lavn—Lavine
LeR—Le Roi engine
Lght—Light Mfg. Co.
Liggt—Liggett Spring & Axle Co.
L-N—Leece-Neville Co.
Lng—Long
Lvgn—Livingston
Lyc—Lycoming
Marm—Maremont Mfg. Co.
McCn—McCanna
M&E—Merchant & Evans
McC—McCord
Mech—Mechanics Machine
Merl—Merrill Spring Co.
Mnrch—Monarch
Mod—Modine Mfg. Co.
Morg—Morgan Mfg. Co.
Math—Mather
Munc—Muncie
MWC—Motor Wheel Corp.
Natl—National Can Co.
Natn—National Axle Co.
N-E—North East
Own&Sp—Own & Spicer
P&B—Parish & Bingham
Pfx—Perfex radiator
Pgh—Pittsburgh Pressed Steel
Phro—Pharo Mfg. Co.
Pitt — Pittsburgh Model Engine Co.
Prsh—Parish Mfg. Co.
Prud—Prudden
Rayfld—Rayfield
Rowl—Wm. H. Rowland
Roy — Royer Wheel Co.
R-T—Rome-Turney
Russl—Russel Axle Co.
Sag—Saginaw
Sal—Salisbury
Savg—Savage Arms
Sch—Schwarz Wheel Co.
Schblr—Schebler
Shar—Sharon Pressed Steel Co.
Shel—Sheldon
Sim—Simms Magneto Co.
Simp—Simplex
S-K—Slick Knox Steel Co.
Smh—A. O. Smith
Sn & Ac—Snead & Acme
Sn&Sp—Snead & Spicer
S-P—Standard Parts Co.
Sp&Fl—Spicer & Flexite
Spltf—Splitdorf
Sp-P—Spring Perch Co.
Sp&Pet—Spicer & Peters
Stan—Standard radiator
Stand — Standard Steel Spring Co.
Sterl—Sterling bearings
Stmbg—Stromberg
Stn—Standard Wheel Co.
Sth—Smith steel wheel
S-W—Sparks-Withington
Th&Ba Thermoid & Baker
Th&Bl—Thermoid & Blood
Therm—Thermoid
Th—Sp—Thermoid & Spicer
Till—Tillotson
Timkn—Timken
Torbn—Torbensen
Trav—Traverse City Iron Works
T-S—Turner-Seymour
Tuth—Tuthill
Unv—Universal
Unvsl—Universal Mach.
U.P.—U. P. Products Co.
U.S.—U. S. Spring Co.
Wab — Wabash Radiator Co.
Warn—Warner
Wau—Waukesha
Way—Wayne Wheel Co.
Wed—Weidley
West—Westinghouse
We-W — Western Wheel Co.
Wis—Wisconsin Parts
Wol—Wohlrab
W-S—West Steel Castings Co.
Wsc—Wisconsin engine
Yng—Youngstown Pressed Steel Co.

Specifications of Gas

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME			TIRES			WHEELS		ENGINE															
							Size in Ins.							COOLING						IGNITION			ELEC. SYSTEM		
															RADIATOR										
															CASE		CORE								
			Make	Material	Type	Kind	Front	Rear	Make	Type	Make	No. Cyl. Bore and Stroke—N.A.C.C. Hp.	Cylinders Cast	Water Circ.	Make	Type	Make	Type	Type	Make	Spark Advance	Type	Make	Extra Cost $
Chicago	C3½	3½	168	own..	rol-c..	s-flex..	sol...	36x5	36x10	Stn...	cst...	Her...	4-4½x5½-32.4	4	cent..	own...	cst...	Brem .	fin...	sing..	Bosch.	fixed..	.....	.....	....
Chicago	D5	5	167	own..	rol-c..	s-flex..	sol...	36x6	40x12	Stn...	cst...	Her...	4-4½x5½-32.4	4	cent..	own...	cst...	Brem .	fin...	sing..	Bosch.	fixed..	.....	.....	....
Climber	A	1½	146	Savr..	p-stl..	s-flex..	pnu*.	36x6	38x7	Roy...	wd...	H-S..	4-3½x5 -19.6	4	ther..	Chgo..	cst...	Chgo..	fin...	sing..	A-Knt	hand..	s&i-2.	West..	none
Clydesdale	32C	1	144	P&B..	p-stl..	s-flex..	sol*.	34x3½	34x5	Bim...	wd...	own...	4-4½x5 -22.5	4	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	150
Clydesdale	42C	1½	146	P&B..	p-stl..	flex...	sol...	36x3½	36x5	Bim...	wd...	own...	4-4½x5 -22.5	4	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	150
Clydesdale	65C	2½	163	P&B..	p-stl..	flex...	sol...	36x4	36x7	Sth...	mt...	own...	4-4½x5½-29.0	4	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	150
Clydesdale	65EC	2½	163	P&B..	p-stl..	flex...	sol...	36x4	36x7	Sth...	mt...	own...	4-4½x5½-32.4	4	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	160
Clydesdale	90C	3½	190	P&B..	p-stl..	flex...	sol...	36x5	40x10	Sth...	mt...	own...	4-4½x5½-32.4	4	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	160
Clydesdale	120C	5	204	P&B..	p-stl..	flex...	sol...	36x6	40x12	Sth...	mt...	own...	4-4½x6 -36.1	2	cent..	own...	cst...	own...	pln...	sing..	Bosch.	hand..	s&i...	West..	170
Commerce	T	¾	127	Drt...	rol-c..	.....	pnu...	34x4½	34x4½	Bim...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Long..	cst...	Long..	fin...	sing..	Eismn.	hand..	s&l...	Bijur..	none
Commerce	12	1	130	Drt...	p-stl..	flex...	pnu...	35x5	35x5	Bim...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Long..	cst...	Long..	fin...	sing..	Eismn.	hand..	s&l...	Bijur..	none
Commerce	16	1½	137	Drt...	p-stl..	flex...	pnu...	35x5	36x6	Bim...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Long..	cst...	Long..	fin...	sing..	Eismn.	hand..	s&l...	Bijur..	none
Concord	A	....	140	P&B..	p-stl..	.....	sol...	36x3½	36x6	Sth...	mt...	Buda..	4-4 x5½-25.6	4	cent..	own...	.....	own...	fin...	sing..	Eismn.	.....	none.	.....	....
Concord	AX	....	150	P&B..	p-stl..	.....	sol...	36x3½	36x6	Sth...	mt...	Buda..	4-4 x5½-25.6	4	cent..	own...	.....	own...	fin...	sing..	Eismn.	.....	none.	.....	....
Concord	B	....	150	P&B..	p-stl..	.....	sol...	36x4	36x8	Sth...	mt...	Buda..	4-4½x5½-28.9	4	cent..	own...	.....	own...	fin...	sing..	Eismn.	.....	none.	.....	....
Concord	BX	....	170	P&B..	p-stl..	.....	sol...	36x4	36x8	Sth...	mt...	Buda..	4-4½x5½-28.9	4	cent..	own...	.....	own...	fin...	sing..	Eismn.	.....	none.	.....	....
Cook	41	2	95	own...	p-stl..	flex...	pnu...	36x6	38x7	Crn...	wd...	Her...	4-4 x5½-25.6	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Berlg..	hand..	lghtg..	G&D..	none
Corbitt	E	1	130	own...	rol-c..	s-flex..	sol...	34x3½	34x4	Bim...	wd...	Cont..	4-3½x5 -22.5	4	ther..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	s&i-2.	G&D..	150
Corbitt	D	1½	140	own...	rol-c..	s-flex..	sol...	36x3½	36x5	Bim...	wd...	Cont..	4-3½x5 -22.5	4	ther..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	s&i-2.	G&D..	150
Corbitt	C	2	148	own...	rol-c..	s-flex..	sol...	36x3½	36x7	Bim...	wd...	Cont..	4-4½x5½-27.2	4	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	75
Corbitt	B	2½	152	own...	rol-c..	s-flex..	sol...	36x4	36x7	Bim...	wd...	Cont..	4-4½x5½-27.2	4	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	75
Corbitt	A	3½	178	own...	rol-c..	s-flex..	sol...	36x5	36x10	Sth...	mt...	Cont..	4-4½x5½-32.4	2	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	75
Corbitt	AA	5	178	own...	rol-c..	rigid..	sol...	36x6	40x6d	Sth...	mt...	Cont..	4-4½x6 -36.1	2	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	none
Day-Elder	A	1	128	Savg..	p-stl..	s-flex..	sol*.	34x3½	34x4	Jns...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg*.	Eism*.	....
Day-Elder	B	1½	144*	Savg..	p-stl..	s-flex..	sol*.	34x3½	34x5	Jns...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg*.	Eism*.	....
Day-Elder	D	2	144*	Savg..	p-stl..	s-flex..	sol*.	36x4	36x7	Jns...	wd...	Cont..	4-4½x5½-27.3	4	cent..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg*.	Eism*.	....
Day-Elder	C	2½	150*	Savg..	p-stl..	s-flex..	sol*.	36x4	36x7	Jns...	wd...	Buda..	4-4½x5 -29.0	4	cent..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg*.	Eism*.	....
Day-Elder	F	3½	165*	Savg..	p-stl..	s-flex..	sol*.	36x5	36x5d	Jns...	wd...	Cont..	4-4½x5½-32.4	2	cent..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg*.	.....	....
Day-Elder	E	5	170	Savg..	p-stl..	s-flex..	sol...	36x5	36x6d	Jns...	wd...	Buda..	4-4½x6 -32.4	4	cent..	Bush..	cst...	Bush..	fin...	sing..	Eismn.	hand.	lghtg..	Eism*.	105
Dearborn	F	1½	124	Savg..	p-stl..	s-flex..	sol*.	34x4	34x5	Crn...	wd...	Buda..	4-3½x5½-22.5	4	ther..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	none.	.....	....
Dearborn	48	2	148	Cas...	rol-c..	s-flex..	pnu...	35x5	34x7	Crn...	wd...	Buda..	4-3½x5½-22.5	4	ther..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	none.	.....	....
Defiance	D	1½	140	Drt...	p-stl..	flex...	pnu...	35x5	36x6	Crn...	wd...	Hghy.	4-3½x5 -22.5	4	cent..	Pfx...	cst...	Pfx...	cel...	sing..	Eismn.	hand.	s&l-2.	Aut-L.	150
Defiance	E	2	140	Drt...	p-stl..	flex...	pnu...	35x5	38x7	Crn...	wd...	Hghy.	4-3½x5 -22.5	4	cent..	Pfx...	cst...	Pfx...	cel...	sing..	Eismn.	hand.	s&l-2.	Aut-L.	150
DeKalb	E2	2	134	Prsh..	p-stl..	flex...	sol*.	34x3½	36x5	Sch...	wd...	Cont..	4-4½x5½-27.2	4	cent..	Jck..	sht...	Jck..	pln...	sing..	Eismn.	hand.	none.	.....	....
DeKalb	E2½	2½	136	Prsh..	p-stl..	flex...	sol*.	36x4	36x6	Sch...	wd...	Cont..	4-4½x5½-27.2	4	cent..	Jck..	sht...	Jck..	pln...	sing..	Eismn.	hand.	none.	.....	....
Dependable	A	1	134	Cas...	p-stl..	flex...	pnu...	34x5	36x6	Bim...	wd...	H-S..	4-3½x5 -19.6	4	ther..	Lng..	cst...	Lng..	cel...	sing..	Spltf..	hand.	s&l...	Aut-L.	none
Dependable	C	1½	128	Prsh..	p-stl..	flex...	sol*.	34x3½	34x5	Bim...	wd...	Buda..	4-3½x5½-22.5	4	cent..	Lng..	cst...	Lng..	fin...	sing..	Spltf..	hand.	s&l...	West..	....
Dependable	D	2	128	Prsh..	p-stl..	flex...	sol...	34x5	36x6	Bim...	wd...	Buda..	4-4 x5½-25.6	4	cent..	Lng..	cst...	Lng..	fin...	sing..	Spltf..	hand.	s&l...	West..	....
Dependable	E	2½	157	Prsh..	p-stl..	flex...	sol*.	36x4	36x7	Bim...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Lng..	cst...	Lng..	fin...	sing..	Spltf..	hand.	s&l...	West..	....
Dependable	G	3½	160	Cas...	p-stl..	flex...	sol...	36x6	38x7	Bim...	wd...	Buda..	4-4½x6 -32.4	4	cent..	Lng..	cst...	Lng..	fin...	sing..	Spltf..	hand.	s&l...	West..	....
Diamond-T	T	1½	144	Smh..	p-stl..	.....	sol...	36x3½	36x5	.....	wd...	Hink..	4-3½x5½-32.4	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand.	.....	.....	....
Diamond-T	U	2	160	Smh..	p-stl..	s-flex..	sol...	36x4	36x7	.....	wd...	Hink..	4-4 x5½-25.6	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand.	.....	.....	....
Diamond-T	K	3½	170	Smh..	p-stl..	s-flex..	sol...	36x5	36x5d	.....	wd...	Hink..	4-4½x5½-29.0	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand.	.....	.....	....
Diamond-T	EL	5	180	Smh..	p-stl..	s-flex..	sol...	36x6	40x6d	.....	wd...	Hink..	4-4½x5½-32.4	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand.	.....	.....	....
Diamond-T	S	5	180	Smh..	p-stl..	.....	sol...	36x6	40x6d	.....	wd...	.....	4-4½x6 -36.1	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand.	.....	.....	....
Dodge Brothers	.....	½	114	Drt...	p-stl..	flex...	pnu...	33x4	34x4	Kel...	wd...	own...	4-3½x4½-24.3	4	cent..	McC..	cst...	McC..	pln...	sing..	N-E..	auto..	sl&i..	N-E..	....
Dorris	K-4	2	.....	Smh..	p-stl..	flex...	sol...	36x4	36x7	Sth...	mt...	own...	4-4½x5½-29.0	4	cent..	own...	cst...	McC..	fin...	sing..	Bosch.	hand.	s&l...	West..	175
Dorris	K-7	3½	174	Smh..	p-stl..	flex...	sol...	36x5	36x10	Sth...	mt...	own...	4-4½x5½-29.0	4	cent..	own...	cst...	McC..	fin...	sing..	Bosch.	hand.	s&l...	West..	175
Douglas	.....	1½	128	own...	p-stl..	.....	sol*.	36x5	37x8	own...	wd...	Weid..	4-3½x5½-22.5	4	cent..	Chgo..	cst...	Chgo..	sq-t...	sing..	Eismn.	hand.	sl&i-2.	West..	100
Douglas	.....	3	144	own...	p-stl..	.....	opt...	36x6	37x8	own...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Chgo..	cst...	Chgo..	sq-t...	sing..	Eismn.	hand.	sl&i-2.	West..	100
Duplex	A	2½	145	P&B..	p-stl..	rigid..	pnu...	35x5	38x7	Prud..	wd...	Hink..	4-4 x5½-25.6	4	cent..	Mod..	cst...	Mod..	fin...	sing..	West..	hand.	s&l-2..	West..	none
Duplex	E	3½	130	P&B..	p-stl..	rigid..	sol...	36x8	36x8	Prud..	wd...	Buda..	4-4½x5½-29.0	4	cent..	Long..	prs...	Long..	p-t...	sing..	Eismn.	hand.	none.	.....	....
Duty	21	2	134	own...	rol-c..	s-flex..	sol...	34x3½	34x5	Stn...	wd...	Gray..	4-3½x5 -19.6	4	ther..	Eurk..	cst...	Eurk..	cel...	sing..	Spltf..	hand.	none.	.....	....
Eagle	100-2	2	130	own...	p-stl..	flex...	sol*.	34x3½	34x6	Stn...	wd...	Buda..	4-3½x5½-22.5	4	.....	own...	cst...	own.	cel...	sing..	Eismn.	hand.	.....	.....	....
Elmira	C	½	105	own...	rol-c..	s-flex..	pnu...	28x3	28x3	Mott..	wr...	LeR..	4-3½x4½-15.6	4	ther..	Cocn..	pst...	Cocn..	zz-t...	sing..	Spltf..	hand.	lghtg.	W-L..	none
Erie	A	2½	150	own...	p-stl..	s-flex..	sol*.	36x4	36x4d	Way..	wd...	Buda..	4-4½x5½-29.0	4	cent..	own...	cst...	McC..	fin...	sing..	Bosch.	hand.	lghtg.	.....	none
Facto	1921	2½	156	.....	p-stl..	.....	sol*.	36x4*	36x8*	Sth...	mt...	Buda..	4-4½x5½-29.0	4	.....	Bush..	.....	Bush..	fin...	.....	Spltf..	.....	.....	.....	....
Fageol (Cal.)	.....	1½	136	own...	rol-c..	s-flex..	sol*.	34x3½	34x6	Stn...	mt...	Wau..	4-3½x5½-22.5	4	cent..	own..	cst...	Mod..	fin...	sing..	Spltf..	hand..	lghtg..	Spltf..	....
Fageol (Cal.)	.....	2½	144	own...	rol-c..	s-flex..	sol*.	34x4	36x7	Stn...	mt...	Wau..	4-4½x5½-29.0	2	cent..	own..	cst...	Mod..	cel...	sing..	Spltf..	hand.	lghtg..	Spltf..	....
Fageol (Cal.)	.....	3½	172	own...	p-stl..	.....	sol*.	36x5	36x5d	Stn...	mt...	Wau..	4-4½x6½-32.6	2	cent..	own..	cst...	Mod..	cel...	sing..	Spltf..	hand.	lghtg..	Spltf..	....
Fageol (Cal.)	.....	5	174	own...	p-stl..	.....	sol...	36x6	40x6d	Stn...	mt...	Wau..	4-4½x6½-32.4	2	cent..	own..	cst...	Mod..	zz-t...	sing..	Spltf..	hand.	lghtg..	Spltf..	....
Fageol (Ohio)	Md	2½	150	own...	rol-c..	flex...	sol*.	36x4	36x4	Stn...	mt...	Wau..	4-4½x5½-18.2	2	cent..	own..	cst...	Mod..	cel...	sing..	Laur..	hand..	none.	.....	cent
Fageol (Ohio)	Hd	3½	172	own...	p-stl..	s-flex..	sol*.	36x5	40x5d	Stn...	mt...	Wau..	4-4½x6½-29.0	2	cent..	own..	cst...	Mod..	cel...	sing..	Laur..	hand..	none.	.....	cent
Federal	SD	1	132	Drt...	p-stl..	s-flex..	pnu...	35x5	36x6	Drt...	mt...	Cont..	4-3½x5 -22.5	4	cent..	own..	pst...	Long..	fin...	sing..	Eismn.	fixed..	lghtg.	Aut-L.	none
Federal	TE	1½	144	Drt...	p-stl..	s-flex..	sol...	36x3½	36x5	Auto..	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	pst...	Long..	fin...	sing..	Eismn.	fixed..	none.	.....	....
Federal	UE	2	156	Drt...	p-stl..	s-flex..	sol...	36x4	36x7	Auto..	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	pst...	Long..	fin...	sing..	Eismn.	fixed..	none.	.....	....
Federal	WE	3½	156	Drt...	p-stl..	s-flex..	sol...	36x5	36x5d	Sth...	mt...	Cont..	4-4½x5½-32.4	2	cent..	own..	pst...	Long..	fin...	sing..	Eismn.	fixed..	none.	.....	....
Federal	XE	5	156	Russl..	rol-c..	s-flex..	sol...	36x6	40x6d	Sth...	mt...	Cont..	4-4½x5½-32.4	2	cent..	own..	pst...	Long..	fin...	sing..	Eismn.	fixed..	none.	.....	....
Ford	TT	1	123	.....	p-stl..	flex...	pnu...	30x3½	32x4½	Hay*..	wd...	own...	4-3½x4 -22.5	4	ther..	own..	pst...	own..	fin...	dual..	own..	hand..	sl&i-2.	own..	70
F.W.D.	B	3	124	own...	p-stl..	s-flex..	sol...	36x6	36x6	Sch...	wd...	Wsc...	4-4½x5½-36.1	2	cent..	McC..	cst...	McC..	pln...	sing..	Eismn.	hand.	s&l-2..	N-E..	....
Fulton	A	¾	130	Shar..	p-stl..	flex...	pnu...	35x5	35x5	H&D..	wd...	H-S..	4-3½x5 -19.6	4	ther..	Lvgn..	cst...	Lvgn..	cel...	sing..	Berlg..	hand..	s&l-2..	West..	none
Fulton	C	2	137	Shar..	p-stl..	flex...	sol...	34x4	34x6	H&D..	wd...	H-S..	4-3½x5 -19.6	4	ther..	T-S..	cst...	G&O.	cel...	sing..	Berlg..	hand..	s&l-2..	West..	178
Garford	25B	1½	135	own...	p-stl..	s-flex..	sol...	36x3½	36x4	.....	wd...	Buda..	4-3½x5½-22.5	4	cent..	own...	cst...	.....	fin...	sing..	Spltf..	hand..	s&l-2..	West..	....
Garford	70H	2	144	own...	p-stl..	s-flex..	sol...	36x4	36x7	.....	wd...	Buda..	4-4½x5½-29.0	4	cent..	own...	cst...	.....	fin...	sing..	Spltf..	hand..	s&l-2..	West..	....
Garford	68	5	128	own...	p-stl..	s-flex..	sol...	36x6	40x6d.	Sth...	mt...	Wsc...	4-4½x5½-36.1	2	cent..	own...	cst...	.....	fin...	sing..	.....	hand.	none.	.....	....
Garford	77D	3½	162	own...	p-stl..	s-flex..	sol...	36x5	36x5d	Sth...	mt...	Buda..	4-4½x6 -32.4	4	cent..	own...	cst...	.....	fin...	sing..	Spltf..	hand.	s&l-2.	West.	....
Garford	68D	5	162	own...	p-stl..	s-flex..	sol...	36x6	40x6d	Sth...	mt...	Buda..	4-5 x6½-40.0	4	cent..	own...	cst...	.....	fin...	sing..	Spltf..	hand.	.....	.....	....
Gary	I	1½	144	P&B..	p-stl..	flex...	pnu*.	35x5	38x7	MWC.	wd...	Buda..	4-4½x5½-27.2	4	cent..	own...	cst...	Chgo.	fin...	sing..	Eismn.	hand..	none.	.....	....
Gary	J	2½	148	P&B..	p-stl..	flex...	pnu*.	36x6	40x8	MWC.	wd...	Buda..	4-4½x5½-29.0	4	cent..	own...	cst...	Chgo.	fin...	sing..	Eismn.	hand..	none.	.....	....
Gary	KT	3½	162	P&B..	p-stl..	flex...	sol...	36x5	40x5d.	MWC.	wd...	Buda..	4-4½x6 -32.4	4	cent..	own...	cst...	Chgo.	fin...	sing..	Eismn.	hand..	none.	.....	....
Gary	M	5	182	P&B..	p-stl..	flex...	sol...	36x6	40x6d	Day..	mt...	Buda..	4-5 x6½-40.0	4	cent..	own...	cst...	Chgo.	fin...	sing..	Eismn.	hand..	none.	.....	....
G.M.C.	16	¾	132	Sth...	p-stl..	s-flex..	pnu...	35x5	35x5	.....	wd...	Cont..	4-3½x5 -22.5	4	cent..	McC..	prs...	McC..	fin...	sing..	Eismn.	hand..	sl&i..	Delco	....
G.M.C.	31	1½	130	Sth...	p-stl..	s-flex..	sol...	36x3½	36x5	opt...	wd...	Cont..	4-3½x5 -22.5	4	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	....
G.M.C.	41	2	158	Sth...	p-stl..	s-flex..	sol...	36x4	36x7	own...	mt...	Cont..	4-4½x5½-27.2	4	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	....
G.M.C.	71	3½	187	own...	rol-c..	s-flex..	sol...	36x5	40x5d	own...	mt...	Cont..	4-4½x5½-32.4	2	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg..	Eismn.	....
G.M.C.	101	5	187	own...	rol-c..	s-flex..	sol...	36x6	40x6d	.....	wd...	Cont..	4-4½x5½-32.4	2	cent..	McC..	cst...	McC..	fin...	sing..	Eismn.	hand..	lghtg.	Eismn.	....
Graham Bros.	A	1½	133	Drt...	p-stl..	flex...	pnu...	35x5	36x6	Ditl..	pst...	Cont..	4-3½x5 -22.5	4	ther..	Yng..	prs...	Yng..	fin...	sing..	Eismn.	hand.	sl&i..	Eismn.	75
Gramm-Bernstein	10	1	128	own...	p-stl..	s-flex..	pnu...	33x5	33x5	.....	wd...	.....	4-3½x5 -19.6	4	ther..	own...	.....	.....	fin...	sing..	.....	hand.	sl&i.	.....	....
Gramm-Bernstein	15	1½	138	own...	p-stl..	flex...	opt...	36x3½	36x5	Bim...	wd...	Cont.	4-3½x5 -22.5	4	ther..	own...	cst...	Long..	fin...	sing..	N-E..	hand.	sl&i-2.	N-E..	80
Gramm-Bernstein	65	1½	138	own...	p-stl..	flex...	opt...	36x3½	36x5	Bim...	wd...	Cont.	4-3½x5 -22.5	4	ther..	own...	cst...	Long..	fin...	sing..	N-E..	hand.	sl&i-2.	N-E..	80
Gramm-Bernstein	20	2	144	own...	p-stl..	flex...	opt...	36x4	36x7	Bim...	wd...	Cont.	4-4½x5½-27.3	4	cent..	own...	cst...	Long..	fin...	sing..	N-E..	hand.	sl&i-2.	N-E.	80
Gramm-Bernstein	25	2½	150	own...	p-stl..	flex...	opt...	36x4	36x4d	Sth...	mt...	Hink..	4-4½x5½-29.0	4	cent..	own...	cst...	Long.	fin...	dual..	Eismn.	hand.	sl&i-2.	N-E..	100

For abbreviations see page 336.

oline Trucks—*Continued*

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE								STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By	Springs Make	Foot	Hand	Placed	Make	Levers	Type	Make	Name and Model
cent..	Simp...	motor.	1150	14	Stmbg..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.33	sprgs..	sprgs..	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Peters.	Chicago C3½
cent..	Simp...	motor.	1150	12	Stmbg..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	13.66	sprgs..	sprgs..	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Peters.	Chicago D5
none.	.....	.....	1500	20	Stmbg..	.....	d-p*..	Munc*	selec..	Muncie	mtr...	3	int-g..	Torbn.	8.40	sprgs..	sprgs..	Liggt..	ext-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Climber A
cent..	own...	motor	1300	18	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	S-P...	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 32C
cent.	own...	motor.	1410	17	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 42C
cent.	own...	motor.	1410	16	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 65C
cent.	own...	motor.	1500	15	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 45EC
cnet.	own...	motor.	1310	15	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 90C
cent.	own...	motor.	1380	14	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd...	sprgs..	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Clydesdale 120C
none.	.....	.....	2200	40	Zenith..	vac..	cone..	Detrt..	selec..	Detrt..	mtr...	3	bevel.	Sal...	5.14	sprgs..	sprgs..	Dtr...	ext-r-w	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer.	Commerce T
none.	.....	.....	2200	40	Zenith..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	Torbn.	7.00	sprgs..	sprgs..	Dtr...	ext-r-w	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer.	Commerce 12
none.	.....	.....	2200	40	Zenith..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	Torbn.	7.00	sprgs..	sprgs..	Dtr...	ext-r-w	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer.	Commerce 16
suct..	Mnrch.	motor.	.....	.....	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.75	sprgs..	sprgs..	Perf...	int-r-w	int-r-w.	l....	Ross.	.....	mtl	Spicer.	Concord A
suct..	Mnrch.	motor.	.....	.....	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.75	sprgs..	sprgs..	Perf...	int-r-w	int-r-w.	l....	Ross.	.....	mtl	Spicer.	Concord AX
suct..	Mnrch.	motor.	.....	.....	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	9.25	sprgs..	sprgs..	Perf...	int-r-w	int-r-w.	l....	Ross.	.....	mtl	Spicer.	Concord B
suct..	Mnrch.	motor.	.....	.....	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	9.25	sprgs..	sprgs..	Perf...	int-r-w	int-r-w.	l....	Ross.	.....	mtl	Spicer.	Concord BX
none.	.....	.....	2500	35	Stmbg..	grv.	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	4	int-g..	Hero..	8.30	sprgs..	sprgs..	S-P...	int-r-w	int-r-w.	l....	Lavn.	ctr..	mtl	Blood.	Cook 41
cent..	Simp...	motor.	1200	18	Stmbg..	grv.	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Shel...	6.50	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt E
cent..	Simp...	motor.	1200	18	Stmbg..	vac..	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Shel...	8.67	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt D
cent..	Simp...	motor.	1200	16	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel...	8.75	sprgs	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt C
cent..	Simp...	motor.	1200	16	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel...	8.75	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt B
cent..	Pierce..	motor.	1050	14	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel...	11.75	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt A
cent..	Cont...	motor.	1000	12	Stmbg..	vac..	d-d...	Detlaf..	selec..	B-Lipe.	amid..	4	worm.	Shel...	10.25	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Corbitt AA
none.	.....	.....	1225	16	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	worm.	Shel...	7.80	sprgs.	sprgs.	Iron...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder A
none.	.....	.....	1225	15	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	worm.	Shel...	8.75	sprgs.	sprgs.	Iron...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder B
suct..	Mnrch.	motor.	1260	14	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	4	worm.	Shel...	8.66	sprgs.	sprgs.	Iron...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder D
suct..	Mnrch.	motor.	1392	14	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	4	worm.	Shel...	8.75	sprgs.	sprgs.	Iron...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder C
suct..	Mnrch.	motor.	1318	12	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel...	10.25	sprgs.	sprgs.	Iron...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder F
suct..	Mnrch.	motor.	863	10	Zenith..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Shel...	10.25	sprgs.	sprgs.	Shel...	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Hart...	Day-Elder E
none.	.....	.....	1300	16	Stmbg..	vac..	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Wse...	8.25	sprgs.	sprgs.	Marm.	int-r-w	int-r-w.	l....	Ditw.	ctr..	mtl	Hart...	Dearborn F
none.	.....	.....	.....	.....	.....	.....	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Wse...	9.66	sprgs.	sprgs	Marm.	int-r-w	int-r-w.	l....	Ditw.	ctr..	mtl	Hart...	Dearborn 48
none.	.....	.....	1600	25	Stmbg..	vac..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	int-g..	Torbn.	7.00	sprgs.	sprgs.	Dtr...	ext-r-w	int-r-w.	l....	B-M..	ctr..	mtl	Arvac.	Defiance D
none.	.....	.....	1750	25	Stmbg..	vac..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	int-g..	Torbn.	8.00	sprgs.	sprgs.	Dtr...	ext-r-w	int-r-w.	l....	B-M..	ctr..	mtl	Arvac.	Defiance E
none.	.....	.....	1500	18	Master.	grv.	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Timkn	8.50	r-rd...	t-arm.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	DeKalb E2
none.	.....	.....	1500	14	Master.	grv.	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Timkn	9.33	r-rd...	t-arm.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	DeKalb E2½
none.	.....	.....	1800	30	Zenith..	vac..	d-p...	B-Beck.	selec..	Muncie	mtr...	3	worm.	Dunk.	6.20	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Wol.	ctr.	mtl	Acme..	Dependable A
suct..	Mnrch.	.....	1250	18	Zenith..	vac..	d-d...	Fuller.	selec..	Fuller.	mtr...	4	worm.	Wis...	8.25	sprgs.	sprgs.	Stand.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Acme..	Dependable C
suct..	Mnrch.	.....	1600	17	Zenith..	vac..	d-d...	Fuller.	selec..	Fuller.	mtr...	3	worm.	Wis...	8.66	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Acme..	Dependable D
suct..	Mnrch.	.....	1250	14	Zenith..	vac..	d-d...	Fuller.	selec..	Fuller.	amid.	4	worm.	Wis...	8.66	sprgs.	sprgs.	Stand.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Acme..	Dependable E
suct..	Mnrch.	.....	1600	15	Zenith..	vac..	d-d...	Fuller.	selec..	Fuller.	amid.	4	worm.	Wis...	10.00	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Acme..	Dependable G
cent..	.....	motor.	1700	....	Stmbg..	vac..	d-d...	Covert	selec..	Covert.	mtr...	3	worm.	Wis...	8.25	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Gem.	ctr..	....	Spicer.	Diamond-T T
cent..	.....	motor.	1800	....	Stmbg..	vac..	d-d...	Covert	selec..	Covert.	mtr...	4	worm.	Timkn	7.75	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	.....	ctr..	....	Spicer.	Diamond-T U
cent..	.....	motor.	.....	....	Stmbg..	vac..	d-d...	Covert.	selec..	Covert.	amid.	4	worm.	Timkn	8.75	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Gem.	ctr..	f-m	Sn&Sp.	Diamond-T K
cent..	.....	motor.	.....	....	Stmbg..	vac..	d-d...	Covert.	selec..	Covert.	amid.	4	worm.	Timkn	11.66	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Gem.	ctr..	f-m	Sn&Sp.	Diamond-T EL
cent..	Pierce..	motor.	1100	....	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Timkn	11.66	sprgs.	sprgs.	Math.	ext-r-w	int-r-w.	l....	Gem.	ctr..	f-m	Sn&Sp.	Diamond-T S
none.	.....	.....	.....	.....	Stewrt..	vac..	d-d...	own ...	selec..	own...	mtr...	3	bevel.	own...	4.16	t-arm.	t-arm.	own...	int-r-w	int-r-w.	l....	own...	ctr..	mtl	own....	Dodge Brothers
cent..	own...	motor.	1090	13	Stmbg..	grv.	d-d...	Warner	selec..	Warner	amid.	4	worm.	Timkn	7.75	sprgs.	sprgs.	Rowl.	int-r-w	int-r-w.	l....	Ross.	r...	mtl	Spicer.	Dorris K-4
cent.	own...	motor.	1090	11	Stmbg..	grv.	d-d...	Warner	selec..	Warner	amid..	4	worm.	Timkn	10.30	sprgs.	sprgs.	Rowl.	int-r-w	int-r-w.	l....	Ross.	r...	mtl	Spicer.	Dorris K-7
suct..	Pierce..	motor.	2200	12	Schblr..	vac..	d-d...	B-Beck.	selec..	.....	mtr...	3	worm.	Wis...	8.00	sprgs.	sprgs.	r.....	int-r-w	ext-r-w.	l....	.....	ctr..	mtl	Arvac.	Douglas
suct..	Pierce..	motor.	2400	....	Schblr..	vac..	d-d...	.....	selec..	Fuller.	mtr...	4	worm.	Wis...	9.00	sprgs.	sprgs.	.....	ext-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Arvac.	Douglas
none.	.....	.....	1300	25	Stmbg..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	worm.	Shel...	5.50	sprgs.	sprgs.	Penn.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Peters.	Duplex A
cent..	Dplx...	motor.	1200	12	Schblr..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	8	int-g..	own...	8.00	r-rd...	r-rd...	Tuth.	ext-d-s.	ext-r-w.	l....	Wol.	r...	mtl	Peters.	Duplex E
none.	.....	.....	.....	.....	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	int-g..	Russl..	8.20	sprgs.	sprgs.	Chmp.	ext-r-w	int-r-w.	l....	Ditw.	ctr..	mtl	Acme..	Duty 21
none.	.....	.....	1600	....	Zenith..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	int-g..	Russl..	8.80	sprgs.	sprgs.	Chmp.	.....	.....	l....	Lavn.	.....	mtl	M&E..	Eagle 100-2
none.	.....	.....	3000	30	Holley..	vac..	d-p...	B-Beck.	selec..	Covert.	mtr...	3	bevel.	own...	4.40	r-rd...	r-rd...	own...	ext-r-w	ext-r-w.	l....	own...	ctr..	fab	Therm.	Elmira C
cent..	Pierce..	motor.	.....	12	Stmbg..	grv.	d-d...	Fuller.	selec..	Fuller.	amid..	4	worm.	Shel...	.....	r-rd...	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Erie A
.....	.....	.....	1300	18	Zenith..	.....	d-d...	.....	selec..	.....	amid..	4	worm.	Timkn	7.75	.....	.....	.....	.....	.....	l....	.....	ctr..	mtl	Spicer.	Facto 1921
cent..	Wau...	motor.	1500	26	Zenith..	vac..	d-p...	B-Beck.	selec..	own...	mtr...	5	worm.	S-P...	7.75	sprgs.	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Unval.	Fageol (Cal.)
cent.	Wau...	motor.	1100	21	Zenith..	grv.	d-d...	B-Lipe.	selec..	own...	amid.	5	worm.	Timkn	7.75	sprgs.	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Th.	Fageol (Cal.)
cent.	Wau...	motor.	1000	14	Zenith..	vac..	d-d...	B-Lipe.	selec..	own...	amid.	5	worm.	Timkn	10.33	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Th.	Fageol (Cal.)
cent.	Wau...	motor.	1000	14	Zenith..	vac..	d-d...	B-Lipe.	selec..	own...	amid.	5	worm.	Timkn	8.42	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Th.	Fageol (Cal.)
cent.	Wau...	motor.	1200	22	Zenith..	vac..	d-d...	Detlaf..	selec..	own...	amid.	5	worm.	Timkn	7.75	sprgs.	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Th.	Fageol (Ohio) Md
cent.	Wau...	motor.	1100	20	Zenith..	vac..	d-d...	Detlaf..	selec..	own...	amid.	5	worm.	Timkn	8.75	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Th.	Fageol (Ohio) Hd
hyd..	Pharo..	motor.	1447	25	Zenith..	vac..	d-p...	B-Beck.	selec..	own...	amid.	3	worm.	Timkn	6.20	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Peters.	Federal SD
hyd..	Pharo..	motor.	1200	15	Zenith..	grv.	d-p...	B-Beck.	selec..	Detrt..	amid.	4	worm.	Timkn	8.75	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Spicer.	Federal TE
hyd..	Pharo..	motor.	1125	13	Zenith..	grv.	d-p...	B-Beck.	selec..	Detrt..	amid.	4	worm.	Timkn	9.25	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Spicer.	Federal UE
hyd..	Pharo..	motor.	1150	12	Zenith..	grv.	d-p...	B-Beck.	selec..	Warner	amid.	4	worm.	Timkn	10.33	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Spicer.	Federal WE
hyd..	Pharo..	motor.	1150	10	Zenith..	grv.	d-p...	B-Beck.	selec..	Warner	amid.	4	worm.	Timkn	13.66	r-rd...	sprgs.	Math.	int-r-w	int-r-w.	l....	Gem.	ctr..	mtl	Spicer.	Federal XE
none.	.....	.....	1800	18	own...	grv.	w-d...	own...	plan...	own...	mtr...	2	worm.	own...	7.25	t-td...	t-t...	own...	ext-d-s.	int-r-w.	l....	own...	l...	mtl	own....	Ford TT
cent..	Pierce..	motor.	1350	16	Stmbg..	grv.	w-d...	M&E..	ind-c..	Cotta..	amid..	3	bevl-4.	own...	8.90	sprgs..	sprgs.	Tuth.	ext-d-s.	ext-r-w.	r...	Ross.	r...	mtl	Blood.	F.W.D. B
none.	.....	.....	2200	35	Carter..	grv.	d-p...	B-Beck.	selec..	Dur...	mtr...	3	bevel	Col...	6.80	sprgs.	sprgs.	Rowl.	ext-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Spicer.	Fulton A
none.	.....	.....	2200	25	Carter..	grv.	d-d...	Covert.	selec..	Covert.	mtr...	3	int-g..	Russl..	10.20	sprgs.	sprgs.	Rowl.	ext-r-w.	ext-d-s.	l....	Lavn.	ctr..	mtl	Spicer.	Fulton C
none.	.....	.....	.....	.....	Stmbg..	vac..	d-d...	B-Lipe.	selec..	own...	amid.	3	worm.	Timkn	7.75	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l*...	Ross.	ctr..	f-m	Sn&Sp.	Garford 25B
cent..	Simp...	motor.	1085	15	Stmbg..	grv.	d-d...	B-Lipe.	selec..	own...	amid..	4	worm.	Timkn	7.75	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Garford 70H
cent.	Simp...	motor.	1057	11	Rayfld.	grv.	d-d...	B-Lipe.	selec..	own...	jst....	4	chn...	own...	11.44	r-rd...	.....	S-P...	ext-d-s.	int-r-w.	r...	Ross.	r...	mtl	Spicer.	Garford 65
cent.	Simp...	motor.	1144	14	Stmbg..	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	8.75	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Garford 77D
cent.	Simp...	motor.	.....	.....	Stmbg..	grv.	d-d...	.....	selec..	own...	amid..	4	worm.	Timkn	8.80	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Garford 68D
suct.	McCn.	motor.	1250	18	Mas...	grv.	d-d...	Fuller.	selec..	Fuller.	amid..	3	worm.	Timkn	7.25	sprgs.	sprgs.	Dtr...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Gary I
suct.	McCn.	motor.	1200	15	Mas...	grv.	d-d...	Fuller.	selec..	Fuller.	amid.	4	worm.	Timkn	8.50	sprgs.	sprgs.	Dtr...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Gary J
suct.	McCn.	motor.	1050	12	Mas...	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Timkn	10.33	sprgs.	sprgs.	Dtr...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Gary KT
suct.	McCn.	motor.	980	10	Mas...	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid.	4	worm.	Timkn	11.70	sprgs.	sprgs.	Dtr...	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Gary M
suct.	Mnrch.	motor.	1150	20	Marvl.	grv.	d-d...	own...	selec..	own...	amid.	3	bevel.	own...	6.00	r-rd...	sprgs.	Dtr...	ext-r-w	int-r-w.	l....	own...	ctr..	mtl	Unval.	G.M.C 16
suct.	Mnrch.	motor.	1300	15	Marvl.	grv.	d-d...	own...	selec..	own...	amid.	4	worm.	Timkn	9.25	r-rd...	sprgs.	Dtr...	int-r-w	int-r-w.	l....	own...	ctr..	mtl	own....	G.M.C 31
suct.	Mnrch.	motor.	1210	14	Marvl.	grv.	d-d...	own...	selec..	own...	amid.	4	worm.	Timkn	9.25	r-rd...	sprgs.	Dtr...	int-r-w	int-r-w.	l....	own...	ctr..	mtl	own....	G.M.C 41
suct.	Mnrch.	motor.	1210	12	Marvl.	grv.	d-d...	own...	selec..	own...	amid.	4	worm.	Timkn	12.00	r-rd...	sprgs.	Dtr...	int-r-w	int-r-w.	l....	own...	ctr..	mtl	own....	G.M.C 71
suct.	Mnrch.	motor.	1150	10	Marvl.	grv.	d-d...	own...	selec..	own...	amid.	4	worm.	Timkn	13.67	r-rd...	sprgs.	Dtr...	int-r-w	int-r-w.	l....	own...	ctr..	mtl	own....	G.M.C 101
suct.	Mnrch.	motor.	1200	25	Stmbg..	grv.	d-d...	Fuller.	selec..	Fuller.	mtr...	3	int-g..	Torbn.	7.00	sprgs.	sprgs.	Dtr...	ext-r-w	int-r-w.	l....	Lavn.	ctr..	mtl	Hart...	Graham Bros. A
.....	.....	.....	2400	45	.....	grv.	d-p...	.....	selec..	.....	mtr...	3	bevel.	.....	.....	sprgs.	sprgs.	.....	ext-r-w	ext-d-s.	l....	.....	ctr..	fab	.....	 10
none.	.....	.....	1350	21	Stmbg..	grv.	d-d...	Fuller.	selec..	Fuller.	amid.	3	int-g..	Clrk..	7.60	sprgs.	sprgs.	S-P...	ext-r-w	int-r-w.	l....	Ross.	ctr..	fab	own....	Gramm-Bernstein 15
none.	.....	.....	1500	20	Stmbg..	grv.	d-d...	Fuller.	ind-c..	own...	amid.	3	worm.	S-P...	7.80	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr..	fab	own....	Gramm-Bernstein 65
cent..	Pierce..	motor.	1350	18	Stmbg..	grv.	d-d...	Fuller.	ind-c..	own...	amid.	4	worm.	Shel...	7.75	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr.	fab	own....	Gramm-Bernstein 20
cent..	Hink...	motor.	1250	17	Stmbg..	vac..	d-d...	own...	ind-c..	own...	amid..	4	worm.	S-P...	7.75	sprgs.	sprgs.	S-P...	int-r-w	int-r-w.	l....	Ross.	ctr.	fab	own....	Gramm-Bernstein 25

For abbreviations see page 336.

Specifications of Gas

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME			TIRES			WHEELS		ENGINE																
							Size in Ins.								COOLING					IGNITION			ELEC. SYSTEM				
																RADIATOR											
																CASE		CORE									
			Make	Material	Type	Kind	Front	Rear	Make	Type	Make	No. Cyl. Bore and Stroke N.A.C.C. Hp.	Cylinders Cast	Water Circ.	Make	Type	Make	Type	Type	Make	Spark Advance	Type	Make	Extra Cost $
Gramm-Bernstein	35	3½	156	own	p-stl	flex	opt	36x5	40x5d	Sth	mt	Hink	4-4½x5½-32.4	4	cent	own	cst	Long	fin	dual	Eismn	hand	sl&i-2	N-E	100
Gramm-Bernstein	50	5	168	own	p-stl	flex	opt	36x6	40x6d	Sth	mt	Cont	4-4½x6 -36.1	2	cent	own	cst	Long	fin	dual	Eismn	hand	sl&i-2	N-E	100
Grant	17	1½	140	Savg	p-stl	rigid	pnu	35x5	38x7	Roy	wd	Cont	4-3¾x5 -22.5	4	ther	Mod	cst	Mod	cel	sing	Spltf	hand	s&l-2	Remy		
Hahn	CD	1½	140	P&B	p-stl	flex	sol*	36x3½	36x5	Sch*	wd*	Cont	4-4½x5½-27.3	4	cent	own	cst	own	fin	sing	Bosch*	hand	s&l	Delco	150	
Hahn	EE	2½	162	Prsh	p-stl	flex	sol*	36x4	36x8	Sch*	wd*	Cont	4-4½x5½-32.4	2	cent	own	cst	Chgo	fin	sing	Bosch*	hand	sl&i	Delco	150	
Hahn	F	3½	165	Savg*	p-stl	flex	sol*	36x5	36x10	Bim*	wd*	Cont	4-4½x5½-32.4	2	cent	own	cst	Chgo	fin	sing	Bosch	hand	s&l	Delco	150	
Hahn	J4	1	132	Prsh	p-stl	flex	pnu*	34x5	34x5	Sen*	wd	Cont	4-3¾x5 -22.5	4	cent	own	cst	Cngo	fin	sing	Bosch	hand	s&l	Delco	155	
Hahn	EF	5	180	Prsh	p-stl	flex	sol	36x6	40x12		mtl	Cont	4-4½x6 -36.2	2	cent	own	cst	Cngo	fin	sing	Bosch	hand	lghtg	Delco	70	
Halfur	E	1	136	P&B	p-stl	s-flex	pnu	35x5	35x5	Stn	wd	Hink	4-4 x5½-25.6	4	cent	own	cst	G&O	fin	sing	Bosch	hand	s&l-2	West	200	
Halfur	B	2½	168	P&B	p-stl	s-flex	sol*	35x5	36x7	Sth	mt	Hink	4-4½x5½-29.0	4	cent	own	cst	G&O	fin	sing	Bosch	hand	s&l-2	West	200	
Hall		1½		own	p-stl		pnu	34x5	38x7		mt	Cont	4-3½x5 -22.5	4	cent	own		own	fin		Bosch		s&l	Delco		
Hall		2½	168	own	rol-c	rigid	sol	36x4	36x6	Sth	mt	Cont	4-4½x5½-27.3	4	cent	Lng	cst	Lng	fin	sing	Bosch	fixed	lghtg	Bosch		
Hall		3½	168	own	rol-c	rigid	sol	36x5	36x5d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	Lng	cst	Lng	fin	sing	Bosch	fixed	lghtg	Bosch		
Hall		5	168	own	rol-c	rigid	sol	36x5	40x6d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	Lng	cst	Lng	fin	sing	Bosch	fixed	lghtg	Bosch		
Hall		7	147	own	rol-c	rigid	sol	36x5	40x6d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	Lng	cst	Lng	fin	sing	Bosch	fixed	lghtg	Bosch		
Harvey	Wea	1½	132	own	p-stl	flex	sol	34x3½	34x5	Crn	wd	Buda	4-4½x5½-27.2	4	cent	Chgo	cst	Chgo	fin	sing	Bosch	fixed				
Harvey	Wfa	2½	150	own	rol-c	rigid	sol	36x4	36x7	Crn	wd	Buda	4-4½x5½-29.0	4	cent	Chgo	cst	Chgo	fin	sing	Eismn	auto				
Harvey	Wha	3½	160	own	rol-c	rigid	sol	36x5	36x5d	Crn	wd	Buda	4-4½x6 -32.4	4	cent	Chgo	cst	Chgo	fin	sing	Eismn	auto				
Harvey	Wka	5	160	own	rol-c	rigid	sol	36x6	40x6d	Sth	mt	Buda	4-4½x6 -32.4	4	cent	Chgo	cst	Chgo	fin	sing	Eismn	auto				
Hawkeye	K	1½	148½	own	rol-c	s-flex	sol*	34x3½	34x5	Bim	wd	Buda	4-3¾x5½-22.5	4	cent	own	cst	Idl	cel	sing	Eismn	hand	s&l-2	opt	150	
Hawkeye	M	2	148½	own	rol-c	s-flex	sol*	36x4	36x6	Bim	wd	Buda	4-4½x5½-29.0	4	cent	own	cst	Idl	cel	sing	Eismn	hand	s&l-2	opt	150	
Hawkeye	N	3½	174	own	rol-c	s-flex	sol*	36x5	36x10	Clrk	mt	Buda	4-4½x6 -32.4	4	cent	own	cst	Idl	cel	sing	Eismn	hand	s&l-2	West		
Hendrickson	I	2½	155	own	rol-c	rigid	opt	36x4	36x7	Stn	mt	Buda	4-4½x5½-29.0	4	cent	Chgo	cst	Chgo	fin	sing	Spltf	hand	none			
Hendrickson	J	3½	175	own	rol-c	rigid	opt	36x5	36x5d	Stn	mt	Buda	4-4½x5½-29.0	4	cent	Chgo	cst	Chgo	fin	sing	Spltf	hand	none			
Higrade	A18	1	115	own	p-stl	flex	pnu	35x5	35x5	Prud	wd	Cont	4-3½x5 -19.6	4	ther	own	cst	Pfx	cel	sing	Eismn	hand	s&l	none		
Higrade	B20	1½	130	own	p-stl	flex	pnu	35x4	36x6	Det	wd	Cont	4-4½x5½-27.2	4	cent	own	prs	C-D	fin	sing	Eismn	hand	s&l			
Huffman	C	1½	140	Hyd	p-stl	s-flex	sol	34x3½	34x	Roy	wd	Buda	4-3½x5½-22.5	4	ther	Lvgn	cst	Lvgn	zz-t	sing	Eismn	hand	none			
Huffman	B	1½	140	Hyd	p-stl	s-flex	sol	34x3½	34x6	Roy	wd	Cont	4-3½x5 -22.5	4	ther	Lvgn	cst	Lvgn	zz-t	sing	Eismn	hand	none			
Independent	F	1½	140	Shar	p-stl	s-flex	opt	36x3½	36x5	Sth	mt	Cont	4-3½x5 -22.5	4	cent	Lng	cst	Lng	fin	sing	Eismn	fixed				
Independent	H	2½	148	Shar	p-stl	s-flex	opt	36x4	36x4d	Sth	mt	Cont	4-4½x5½-27.2	4	cent	Lng	cst	Lng	fin	sing	Eismn	fixed				
Independent	K	3½	160	Shar	p-stl	s-flex	sol	36x5	36x5d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	Lng	cst	Lng	fin	sing	Eismn	fixed				
Indiana	12	1½	134	own	rol-c	s-flex	sol*	34x3½	34x5	Bim	wd	Wau	4-3¾x5½-22.5	4	cent	MeC	cst	MeC	fin	sing	Eismn	hand	s&l	West	175	
Indiana	20	2	150	own	rol-c	s-flex	sol*	36x4	36x7	Day	mt	own	4-4½x5½-27.2	2	cent	MeC	cst	MeC	fin	sing	Eismn	hand	s&l	West	175	
Indiana	25	2½	156	own	rol-c	s-flex	sol*	36x4	36x8	Day	mt	own	4-4½x5½-27.2	2	cent	MeC	cst	MeC	fin	sing	Eismn	hand	s&l	West	175	
Indiana	35	3½	160	own	rol-c	s-flex	sol*	36x5	36x5d	Sth	mt	own	4-4¾x5½-30.6	2	cent	MeC	cst	MeC	fin	sing	Eismn	hand	s&l	West	175	
Indiana	51	5	170	own	rol-c	s-flex	sol*	36x5	40x6d	Sth	mt	Wau	4-5 x6½-40.0	2	cent	MeC	cst	MeC	fin	sing	Eismn	hand	s&l	West	175	
Inland	D	2	132	own	rol-c		sol	34x5	34x6	Bim	wd	Wsc	4-4 x5 -25.6	4	cent	Lng	cst	Lng	fin	sing	Spltf	hand	none			
International	S	¾	124	P&B	p-stl	s-flex	pnu	34x5	34x5	own	wd	Lyc	4-3½x5 -19.6	4	ther	Lng	prs	Lng	fin	sing	Conn	hand	s&l	Auto		
International	H	¼	115	P&B	p-stl	s-flex	opt	36x3½	36x3½	own	wd	own	4-3½x5½-19.6	4	cent	own	prs	own	fin	sing	Bosch	hand				
International	F	1	128	P&B	p-stl	s-flex	opt	36x3½	36x4	own	wd	own	4-3½x5½-19.6	4	cent	own	prs	own	fin	sing	Bosch	hand				
International	K	1½	128	P&B	p-stl	s-flex	opt	36x3½	36x5	own	wd	own	4-3½x5½-19.6	4	cent	own	prs	own	fin	sing	Bosch	hand				
International	G	2	138	P&B	p-stl	s-flex	opt	36x4	36x6	own	wd	own	4-4½x5 -29.0	4	ther	own	prs	own	fin	sing	Spltf	hand				
International	L	3½	160	P&B	p-stl	s-flex	sol	36x5	40x10	own	wd	own	4-4½x5 -29.0	4	ther	own	prs	own	fin	sing	Spltf	hand				
Jackson	4WD	3½	150	Cas	p-stl	s-flex	sol	36x7	36x7	Stn	wd	Cont	4-4½x5½-32.4	2	cent	Lng	cst	Lng	fin	sing	Aut-L	hand	sl&i	Aut-L		
Jumbo	15	1½	144½	Drt	p-stl	s-flex	sol	36x3½	36x5		wd	Buda	4-3½x5½-22.5	4	cent	own	cst	G&O	fin	sing	N-E	hand	sl&i-2	N-E	none	
Jumbo	20	2	144½	Drt	p-stl	s-flex	pnu	35x5	38x7		wd	Buda	4-3½x5½-22.5	4	cent	own	cst	G&O	fin	sing	N-E	hand	sl&i-2	N-E	none	
Jumbo	25	2½	152½	Drt	p-stl	s-flex	sol	36x4	36x7	Day	mt	Buda	4-4½x5½-29.0	4	cent	own	cst	G&O	fin	sing	N-E	hand	lghtg	N-E	none	
Jumbo	30	3	152½	Drt	p-stl	s-flex	pnu	36x6	42x9	Clrk	mt	Buda	4-4½x5½-29.0	4	cent	own	cst	G&O	fin	sing	N-E	hand	lghtg	N-E	none	
Jumbo	35	3½	165	Drt	p-stl	s-flex	sol	36x5	36x10	Clrk	mt	Buda	4-4¼x6 -32.4	4	cent	own	cst	G&O	fin	sing	Eismn	hand	lghtg	N-E	none	
Jumbo	40	4	165	Drt	p-stl	s-flex	pnu	38x7	44x10	Clrk	mt	Buda	4-4 x6 -32.4	4	cent	own	cst	G&O	fin	sing	Eismn	hand	lghtg	N-E	none	
J. & J.	D	2	134	own	rol-c	flex	sol	34x4	34x6	Bim	wd	Wsc	4-4 x5 -25.6	4	cent	own	cst	Chgo	fin	sing	Amer	hand	lghtg		none	
Kalamazoo	G2	1½	144	own	rol-c	flex	sol*	36x4	36x5	Bim*	wd*	Cont	4-3¾x5 -22.5	4	cent	own	cst	G&O	fin	sing	Bosch	hand	s&l-2	Dneto	none	
Kalamazoo	H2	2½	160	own	rol-c	flex	sol	36x4	36x8	Sth	mt	Wsc	4-4 x6 -25.6	4	cent	own	cst	G&O	fin	sing	Bosch	hand	s&l-2	Dneto	none	
Kalamazoo	K2	3½	160	own	rol-c	flex	sol	36x5	36x10	Sth	mt	Wsc	4-4½x6 -27.8	4	cent	own	cst	G&O	fin	sing	Bosch	hand	s&l-2	Dneto	none	
Karavan	A	2½	148	own	rol-c	s-flex	sol*	36x4	36x8	Sth	mt	Buda	4-4½x6 -29.0	4	cent	own	cst	Fed	fin	sing	Berlg	hand	s&l-2	West	200	
Kearns	H	¾	118	Shar	p-stl	s-flex	pnu	32x4½	32x4½	Way	wd	Lght	4-3½x4½-16.9	4	ther	G&O	prs	G&O	cel	sing	Berlg	hand	s&l-2	Dneto	none	
Kearns	N	1½	136	P&B	p-stl	s-flex	sol*	34x3½	34x6	E&O	wd	H-S	4-3½x5 -19.6	4	ther	Bush	cst	Bush	cel	sing	Berlg	hand	none			
Kelly-Springfield	K34	1½	144	own	p-stl	flex	sol	36x3½	36x6	Crn	wd	own	4-3¾x5½-22.5	4	cent	Long	prs	Lng	fin	sing	Eismn	fixed	s&l-2	West	275	
Kelly-Springfield	K36	2½	144	own	p-stl	s-flex	sol	36x4	36x4d	Crn	wd	own	4-3¾x5½-22.5	4	cent	Long	prs	Lng	fin	sing	Eismn	fixed	s&l-2	West	275	
Kelly-Springfield	K40	3½	150	own	p-stl	flex	sol	36x5	40x5d	Crn	wd	own	4-4½x6½-32.4	2	cent	Long	prs	Lng	fin	sing	Eismn	auto	s&l-2	West	275	
Kelly-Springfield	K42	3½	156	own	p-stl	s-flex	sol	36x5	40x5d	Smh	mt	own	4-4½x6½-32.4	2	cent	Long	prs	Lng	fin	sing	Eismn	hand	s&l-2	West	275	
Kelly-Springfield	K41	3½	156	own	p-stl	s-flex	sol	36x5	40x5d	Clk	mt	own	4-4½x6½-32.4	2	cent	Long	prs	Lng	fin	sing	Eismn	hand	s&l-2	West	275	
Kelly-Springfield	K50	5	150	own	p-stl	flex	sol	36x6	40x6d	Sth	mt	own	4-4½x6½-32.4	2	cent	Long	prs	Lng	fin	sing	Eismn	auto	s&l-2	West	275	
Kelly-Springfield	K60	6	150	own	p-stl	flex	sol	36x6	40x7d	Sth	mt	own	4-4½x6½-32.4	2	cent	Long	prs	Lng	fin	sing	Eismn	auto	s&l-2	West	275	
Keystone	40	2	144	own	rol-c	s-flex	pnu	34x5	38x7	Way	wd	Buda	4-3¾x5½-22.5	4	cent	own	cst	MeC	fin	sing	Berlg	hand				
K-Z		2½	150	own	rol-c	s-flex	sol	36x4	36x8	Int	mt	Cont	4-4½x5½-27.2	4	cent	Chgo	cst	Chgo	fin	sing	Bosch	fixed	none			
K-Z		3½	156	own	rol-c	s-flex	sol	36x5	40x10		mt	Her	4-4½x5½-32.4	4	cent	Chgo	cst	Chgo	fin	sing	Bosch	fixed	none			
Kissel	GU	1½	152	Smh	p-stl	rigid	sol	36x3½	36x5	Prud	wd	own	4-3½x5½-24.0	4	cent	MeC	cst	MeC	fin	sing	Eismn	hand	sl&i-2	Eismn	150	
Kissel	F	2½	168	Smh	p-stl	rigid	sol	36x4	36x7	Prud	wd	own	4-4½x5½-29.0	4	cent	MeC	cst	MeC	fin	sing	Eismn	hand	sl&i-2	Eismn	150	
Kissel	HD	4	168	Smh	p-stl	rigid	sol	36x5	36x5	Sth	mt	own	4-4½x5½-29.0	4	cent	MeC	cst	MeC	fin	sing	Eismn	hand	sl&i-2	Eismn	150	
Kleiber	AA	1	130	own	rol-c		sol*	34x3½	34x5	own	wd	Cont	4-4½x5½-27.2	4	cent	own	cst	R-T	fin	sing	Bosch	hand	lghtg	none		
Kleiber	A	1½	143	own	rol-c	s-flex	sol*	36x3½	36x6	own	wd	Cont	4-4½x5½-27.2	4	cent	own	cst	R-T	fin	sing	Bosch	hand	lghtg	none		
Kleiber	BB	2	153	own	rol-c	s-flex	sol*	36x4	36x7	Sth	wd	Cont	4-4½x5½-27.2	4	cent	own	cst	R-T	fin	sing	Bosch	hand	lghtg	none		
Kleiber	B	2½	160	own	rol-c	s-flex	sol	36x4	36x8	Sth	mt	Cont	4-4½x5½-32.4	2	cent	own	cst	R-T	fin	sing	Bosch	hand	lghtg	none		
Kleiber	C	3½	163	own	rol-c	s-flex	sol	36x5d	36x5d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	own	cst	R-T	fin	sing	Bosch	hand	lghtg	none		
Kleiber	D	5	180	own	rol-c	s-flex	sol	36x6	40x12	Sth	mt	Buda	4-5 x6½-40.0	4	cent	own	cst	R-T	fin	sing	Bosch	hand	none			
Koehler	C	1½	131	P&B	p-stl	s-flex	sol	34x3	34x5	Way	wd	H-S	4-3½x5 -19.6	4	ther	own	cst	Godn	cel	sing	Eismn	fixed	none			
Koehler	M	2½	162	P&B	p-stl	s-flex	sol	36x4	36x7	Way	wd	Her	4-4 x5½-25.6	4	cent	own	cst	Godn	cel	sing	Eismn	fixed	none			
Koehler	MT	5	129	P&B	p-stl		sol	35x4	36x7	Way	wd	Her	4-4 x5½-25.6	4	cent	own	csf	Lng	fin	sing	Eismn	fixed	none			
Lange	B	2	136	own	rol-c	rigid	opt	36x4	36x6	H&D	wd	Cont	4-4 x3½-25.6	4	ther	own	sht	Mod	cel	sing	Bosch	hand		none		
Larrabee	U	1½	138	Savg	p-stl	s-flex	sol	34x3½	34x5	H&D	wd	Cont	4-3½x5 -22.5	4	ther	own	cst	Bush	fin	sing	Bosch	hand	sl&i-2	G&D	200	
Larrabee	K	2½		Savg	p-stl	s-flex	sol	36x4	36x7	H&D	wd	Cont	4-4½x5½-27.2	4	cent	own	cst	Bush	fin	sing	Bosch	hand	sl&i-2	Dneto	200	
Larrabee	L	3½		Savg	p-stl	s-flex	sol	36x5	36x5d	Sth	mt	Cont	4-4½x5½-32.4	2	cent	own	cst	Bush	fin	sing	Bosch	hand	lghtg	Eismn	140	
Larrabee	W	5		Savg	p-stl	s-flex	sol	36x6	40x6d	Sth	mt	Cont	4-4½x6 -36.1	2	cent	own	cst	Bush	fin	sing	Bosch	hand	sl&i-2	Dneto		
Lion	L	¾	132	Prsh	p-stl		pnu	35x5	35x5		wd	Buda	4-3½x5½-22.5	4	ther	G&O	prs		sq-t	sing	Eismn	hand				
Lone Star	9	1½	134½	own	rol-c	s-flex	pnu	32x3½	32x4		wd	Gray	4-3½x5 -19.6	4	ther	own		own	fin	sing	Delco	hand	s&l		none	
L.M.C.	2-20	2½	164	own	rol-c	s-flex	sol	36x4	36x4d	Bim	wd	Cont	4-4½x5½-27.2	4	cent	Lng	cst	Lng	fin	sing	Bosch	hand	none			
Luverne	E	1½	140		rol-c			36x6	38x7			H-S	4-3½x5 -16.9				cst			sing	Bosch		s&l	Dneto		
Luedinghaus	K	2	145*	P&B	p-stl	s-flex	sol*	36x4	36x7	Bim*	wd	Wau	4-4½x5½-29.0	2	cent	own	cst	Brem	fin	sing	Spltf	hand	none			
Luedinghaus		1	130		rol-c		pnu	35x5	35x5		wd	H-S	4-3½x5 -19.6	4	Ther		cst		fin		West*		s&l	West*		
Luedinghaus		1½	144		p-stl		sol*	34x3½	34x5		wd	Wauk	4-3¾x5½-22.5		cent		cst		fin	sing	Spltf	hand				

For abbreviations see page 336.

oline Trucks—*Continued*

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE								STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By	Springs Make	Foot	Hand	Placed	Make	Levers	Type	Make	Name and Model
cent..	Hink...	motor.	1200	16	Stmbg..	vac..	d-d...	own....	ind-c..	own....	amid..	4	worm.	S-P...	8.75	sprgs..	sprgs..	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own....	Gramm-Bernstein. . .30
cent..	Cont...	motor.	1150	13	Stmbg..	vac..	d-d...	own....	ind-c..	own....	amid..	4	worm.	S-P...	9.50	sprgs..	sprgs..	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own....	Gramm-Bernstein. . .57
cent..	Pierce..	d-s....	1600	30	Cart...	vac.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	Torbn.	5.50	sprgs..	sprgs..	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Peters.	Grant. 1
cent..	Pierce..	motor.	1400	25	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	sprgs..	sprgs..	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Hahn. . . . . .CD
cent..	Pierce..	motor.	1400	32	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	r-rd..	sprgs..	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Hahn. . . . . .EE
cent..	Pierce..	motor.	1400	32	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd..	sprgs..	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Hahn. . . . . .F
cent..	Pierce..	motor.	1400	....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr....	..	worm.	Shel..	7.75	r-rd..	sprgs..	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Hahn. J4
cent..	Pierce..	motor.	1200	....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	..	worm.	Timkn	10.25	r-rd..	sprgs..	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Hahn. . . . . .EF
cent..	Hink...	motor.	1200	25	Stmbg..	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Timkn	4.70	r-rd..	sprgs..	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Peters.	Halfur. . . . . .E
cent..	Hink...	motor.	1200	20	Stmbg..	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Timkn	5.60	r-rd..	sprgs..	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Peters.	Halfur. . . . . .B
.....	Simp....	.....	.....	....	Zenith..	.....	d-d...	Fuller..	.....	Fuller..	.....	..	worm.	Timkn	.....	.....	.....	Dtr*..	.....	.....	...	Gem.	...	...	.....	Hall. . . . .
cent..	Dplx...	dplx..	1200	18	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	sprgs.	sprgs.	Dtr*..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Spicer.	Hall. . . . .
cent..	Dplx...	dplx..	.....	15	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	Dtr*..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Spicer..	Hall. . . . .
cent..	Dplx...	dplx..	.....	15	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	Dtr*..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Spicer..	Hall. . . . .
cent..	Dplx...	dplx..	.....	15	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	chn...	Timkn	.....	sprgs.	sprgs.	Dtr*..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Spicer..	Hall. . . . .
suct..	Mnrch.	motor.	1200	18	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel..	7.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Harvey. . . . . .Wsa
suct..	Mnrch.	motor.	1200	16	Stmbg..	grv..	d-d...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	7.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Harvey. . . . . .Wfa
suct..	Mnrch.	motor.	1000	14	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	8.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Harvey. . . . . .Wha
suct..	Mnrch.	motor.	1000	13	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.25	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Harvey. . . . . .Wka
cent..	Dplx...	motor.	1175	16	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	7.60	sprgs.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Hawkeye. . . . . .K
cent..	Dplx...	motor.	1175	14	Zenith..	.....	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Clrk..	8.00	sprgs.	sprgs.	Dtr...	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Hawkeye. . . . . .M
cent..	Simp....	motor.	1175	12	Zenith..	grv..	d-d...	Fuller..	selec..	Cotta..	amid..	4	int-g..	Clrk..	10.00	sprgs.	sprgs.	Dtr...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart...	Hawkeye. . . . . .N
suct..	McCn..	.....	1000	15	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	7.75	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	Ther...	Hendrickson. I
suct..	McCn..	.....	1000	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	.....	4	worm.	Timkn	10.3	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	Ther...	Hendrickson. . . . . .J
none..	.....	.....	.....	....	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel..	7.75	sprgs.	sprgs.	Dtr...	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Blood.	Higrade. A18
none..	.....	.....	.....	....	.....	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis...	7.75	sprgs.	sprgs.	Dtr...	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Blood.	Higrade. B20
suct..	Mnrch.	motor.	1500	18	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Torbn.	8.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Hart...	Huffman. C
suct..	Mnrch.	motor.	1500	18	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	.....	8.66	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Hart...	Huffman. . . . . .B
cent..	.....	motor.	1500	18	.....	grv..	d-d...	Fuller..	prog..	Fuller..	mtr...	3	worm.	Wis...	8.25	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Independent. . . . . .F
cent..	.....	motor.	1300	14	.....	grv..	d-d...	Fuller..	prog..	Fuller..	mtr...	3	worm.	Wis...	9.66	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Independent. . . . . .H
cent..	.....	motor.	1300	14	.....	grv..	d-d...	Fuller..	prog..	Fuller..	mtr...	4	worm.	Wis...	10.00	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Independent. . . . . .K
cent..	Wau...	motor.	1300	18	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	3	worm.	Shel..	7.80	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Wol..	ctr..	f-m	Sn&Ac.	Indiana. 12
cent..	Pierce..	motor.	1160	16	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	7.75	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Wol..	ctr..	f-m	Sn&Sp.	Indiana. 20
cent..	Pierce..	motor.	1160	16	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	7.75	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Wol..	ctr..	f-m	Sn&Sp	Indiana. 25
cent..	Pierce..	motor.	1150	12	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.25	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Wol..	ctr..	f-m	Sn&Sp.	Indiana. 35
cent..	Wau...	motor.	1000	12	Stmbg..	grv..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.21	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Wol..	ctr..	f-m	Sn&Sp.	Indiana. 51
none..	.....	.....	1600	18	Schblr..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Torbn.	9.00	sprgs.	sprgs.	Math.	ext-...	int....	l....	Lavn.	ctr..	mtl	Unvsl.	Inland. . . . . .D
none..	.....	.....	1500	35	Ens....	vac..	d-d...	Munc..	selec..	Munc..	mtr...	3	int-g..	Torbn.	6.30	sprgs.	sprgs.	Stand.	ext-r-w.	int-r-w.	l....	CAS..	ctr..	fab	Snead..	International. . . . . .S
cent..	own....	motor.	1275	20	Ens....	grv..	d-d...	own....	selec..	own....	amid..	3	int-g..	own..	6.80	sprgs.	sprgs.	Stand.	int-r-w.	int-r-w.	l....	own..	ctr..	mtl	own....	International. . . . . .H
cent..	own....	motor.	1275	17	Ens....	grv..	d-d...	own....	selec..	own....	amid..	3	int-g..	own..	7.90	sprgs.	sprgs.	Stand.	int-r-w.	int-r-w.	l....	own..	ctr..	mtl	own....	International. . . . . .F
cent..	own....	motor.	1275	15	Ens....	grv..	d-d...	own....	selec..	own....	amid..	3	int-g..	own..	8.96	sprgs.	sprgs.	Stand.	int-r-w.	int-r-w.	l....	own..	ctr..	mtl	own....	International. . . . . .K
cent..	own....	motor.	1150	13	Ens....	grv..	d-d...	own....	selec..	own....	amid..	3	int-g..	own..	8.96	sprgs.	sprgs.	Stand.	int-r-w	int-r-w.	l....	own..	ctr..	mtl	own....	International. . . . . .G
cent..	own....	motor.	1125	12	Ens....	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	int-g..	own..	10.90	sprgs.	sprgs.	Stand.	int-r-w	int-r-w.	l....	own..	ctr..	mtl	own....	International. L
cent..	Pierce..	motor.	1027	12	Stmbg..	vac..	d-p...	B-Beck.	selec..	own....	amid..	4	bevl..	own..	9.17	sprgs.	sprgs.	S-P...	int-r-w.	ext-d-s.	l....	Ross.	ctr..	mtl	Spicer..	Jackson. 4WD
none..	.....	.....	1500	22	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	7.20	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Arvac..	Jumbo. 15
none..	.....	.....	1500	22	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	7.60	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Arvac..	Jumbo. 20
cent..	Dplx...	Dplx..	1250	15	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Clrk..	9.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Arvac..	Jumbo. 25
cent..	Dplx...	Dplx..	1250	15	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Clrk..	9.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Arvac..	Jumbo. 30
cent..	Simp....	motor.	1000	12	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	Clrk..	9.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer..	Jumbo. 35
cent..	Simp....	motor.	1000	12	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	Clrk..	10.00	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer..	Jumbo. 40
suct..	Mnrch.	motor.	1400	16	Zenith..	grv..	d-d...	M&E..	selec..	cotta...	mtr...	4	int-g..	Russl.	8.80	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Unvsl.	J. & J. . . . . .D
cent..	Pierce..	motor.	1500	16	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Wis...	8.50	r-rd..	.....	Shel..	int....	int-r-w.	l....	Ross.	ctr..	mtl	Acme*.	Kalamazoo. G2
cent..	Pierce..	motor.	1100	13	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel..	8.75	r-rd..	.....	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Acme*.	Kalamazoo. H2
cent..	.....	motor.	1100	11	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel..	10.00	r-rd..	.....	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Acme*.	Kalamazoo. K2
cent..	Dplx...	Dplx..	1100	15.2	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	7.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Karavan. . . . . .A
suct..	Mnrch.	motor.	1500	25	Zenith..	grv..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	int-g..	Torbn.	12.00	sprgs.	sprgs.	Math.	int-r-w.	ext-r-w.	l....	Lavn.	ctr..	mtl	M&E..	Kearns. . . . . .H
cent..	Pierce..	motor.	1400	18	Zenith..	grv..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	int-g..	Torbn.	8.00	sprgs.	sprgs.	Math.	int-r-w.	ext-r-w.	l....	Lavn.	ctr..	mtl	M&E..	Kearns. . . . . .N
cent..	Pierce..	motor.	1300	17	Zenith..	grv..	d-p...	B-Beck.	selec..	Covert.	amid..	3	worm.	Shel..	8.66	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	f-m	Bl&Sp..	Kelly-Springfield . . .K34
cent..	Pierce..	motor.	1300	14	Zenith..	grv..	cone..	own....	selec..	Covert.	amid..	3	worm.	Shel..	10.30	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Spicer..	Kelly-Springfield . . .K36
cent..	Pierce..	motor.	1300	14	Zenith..	grv..	cone..	own....	selec..	Covert.	amid..	3	chn...	own..	10.49	r-rd..	.....	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	own....	Kelly-Springfield . . .K40
cent..	Pierce..	motor.	1300	15	Zenith..	grv..	d-p...	B-Beck.	selec..	Covert.	amid..	4	worm.	S-P...	10.25	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	f-m	Bl&P..	Kelly-Springfield . . .K42
cent..	Pierce..	motor.	1300	15	Zenith..	grv..	d-p...	B-Beck.	selec.	Covert.	amid..	4	int-g..	Clrk..	10.00	r-rd..	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Gem.	ctr..	f-m	Bl&P..	Kelly-Springfield . . .K41
cent..	Pierce..	motor.	1300	12	Zenith..	grv..	cone..	own....	selec..	Covert.	amid..	3	chn...	own..	12.24	r-rd..	.....	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	own....	Kelly-Springfield . . .K50
cent..	Pierce..	motor.	1300	12	Zenith..	grv..	cone..	own....	selec..	Covert.	amid..	3	chn...	own..	12.39	r-rd..	.....	S-P...	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	own....	Kelly-Springfield . . .K60
cent..	Pierce..	motor.	1350	17	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Russl.	8.90	sprgs.	sprgs.	Rowl..	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Keystone. 40
suct..	McCn..	motor.	1200	14	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	9.25	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Lavn.	ctr..	fab	Therm.	K-Z. . . . .
suct..	McCn..	motor.	1300	12	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.33	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Lavn.	ctr..	fab	Therm.	K-Z. . . . .
cent..	Pierce..	motor.	1237	17	Stmbg..	vac..	d-d...	Warn.	selec..	Warn.	mtr...	3	worm.	Shel..	7.80	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Jacox.	ctr..	mtl	Spicer..	Kissel. . . . . .GU
cent..	Pierce..	motor.	1290	15	Stmbg..	vac..	d-d...	Warn.	selec..	Warn.	amid..	4	worm.	Timkn	8.50	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Kissel. . . . . .F
cent..	Pierce..	motor.	1315	12	Stmbg..	vac..	d-d...	Warn.	selec..	Warn.	amid..	4	worm.	Shel..	11.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Kissel. . . . . .HD
cent..	Pierce..	motor.	.....	.....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	sprgs.	sprgs.	own...	int-r-w.	int-r-w.	r....	Ross.	ctr..	mtl	Spicer..	Kleiber. . . . . .AA
cent..	Pierce..	motor.	.....	.....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	sprgs.	sprgs.	own...	int-r-w.	int-r-w.	r....	Ross.	ctr..	mtl	Spicer..	Kleiber. . . . . .A
cent..	Pierce..	motor.	.....	.....	Stmbg..	grv..	w-d..	M&E..	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	own...	int-r-w.	int-r-w.	r....	Ross.	ctr..	mtl	Spicer..	Kleiber. . . . . .BB
cent..	Pierce..	motor.	.....	.....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	own...	int-f-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Kleiber. . . . . .B
cent..	Dplx...	motor.	.....	.....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd..	sprgs.	own...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Kleiber. C
cent..	Dplx...	motor.	.....	.....	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	r-rd..	sprgs.	own...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Kleiber. . . . . .D
cent..	Dplx...	motor.	1200	18	Zenith..	grv..	d-d...	Mech..	selec..	Mech..	mtr...	3	int-g..	Torbn.	7.00	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l....	own..	ctr..	mtl	K&B..	Koehler. C
cent..	Dplx...	motor.	1200	14	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	9.25	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Spicer..	Koehler. . . . . .M
cent..	Simp....	motor.	1200	14	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	9.25	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Spicer..	Koehler. . . . . .MT
cent..	Pierce..	motor.	1250	17	Stmbg..	grv..	d-d...	M&E..	selec..	own....	.....	3	chn...	own..	9.22	r-rd..	t-t....	Iron..	ext-j-s.	int-r-w.	l....	Gem.	ctr..	mtl	M&E..	Lange. . . . . .B
cent..	Simp....	motor.	1360	18	Schblr..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel..	7.80	sprgs.	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Unvsl.	Larrabee. . . . . .U
cent..	Simp....	motor.	1225	15	Schblr..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	8.75	sprgs.	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sn&Sp.	Larrabee. . . . . .K
cent..	Simp....	motor.	1200	12	Schblr..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.33	sprgs.	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sn&Sp.	Larrabee. L
cent..	Cont...	motor.	1150	10	Schblr..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.25	sprgs.	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sn&Sp.	Larrabee. . . . . .W
suct..	Mnrch.	.....	1500	30	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	.....	sprgs.	sprgs.	Shel..	.....	int-r-w.	l....	Ross.	ctr..	mtl	.....	Lion. I
none..	.....	.....	1000	15	Stmbg..	vac..	d-p...	B-Beck.	.....	Fuller..	mtr...	3	int-g..	Peru..	6.00	sprgs.	.....	Drt...	.....	ext-r-w.	l....	Ditw.	ctr..	fab	Therm.	Lone Star. . . . . .S
cent..	Pierce..	motor.	1150	14	Stmbg..	vac..	d-p...	B-Beck.	selec..	Detrt..	amid..	4	int-g..	Russl.	8.80	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l....	Lavn.	ctr..	f-m	Th&Ba.	L.M.C. 2-2C
.....	.....	.....	.....	.....	Zenith..	.....	.....	B-Beck.	.....	Detrt..	mtr...	..	.....	Torbn.	.....	.....	.....	.....	.....	.....	...	Lavn.	...	...	.....	Luverne. . . . . .F
cent..	.....	motor.	1239	16	Schblr..	grv..	d-p...	B-Beck.	selec.	Detrt..	mtr...	3	worm.	Wsc..	8.66	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Spicer..	Luedinghaus. . . . . .E
.....	.....	.....	.....	25	Scheb..	.....	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	worm.	Emp..	.....	.....	.....	.....	int-r-w.	int-r-w.	.....	.....	.....	.....	.....	Luedinghaus. . . . .
.....	.....	.....	.....	16	Scheb..	.....	d-p...	B-Beck.	selec..	Dtr....	mtr...	3	worm.	Wis...	.....	r-rd..	sprgs.	Tuth..	.....	.....	.....	.....	.....	.....	.....	Luedinghaus. . . . .

For abbreviations see page 336.

Specifications of Gas

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME			TIRES			WHEELS		ENGINE															
							Size in Ins.							COOLING					IGNITION			ELEC. SYSTEM				
															RADIATOR											
															CASE		CORE									
			Make	Material	Type	Kind	Front	Rear	Make	Type	Make	No. Cyl. Bore and Stroke—N.A.C.C. Hp.	Cylinders Cast	Water Circ.	Make	Type	Make	Type	Type	Make	Spark Advance	Type	Make	Extra Cost $
MacDonald	A	15	opt.	.....	rol-c..	rigid..	opt...	40x7	40x14	Sth...	mt...	Buda..	4-4½x6 -32.4	4	cent..	own..	cst...	Mod..	zz-t...	sing..	Spltf..	hand..	none..	.....	....
Mack	AB	1½	162*	own..	p-stl..	flex...	sol....	36x4	36x3½	Sch...	wd...	own..	4-4 x5 -25.6	2	cent..	own..	sht...	own..	cel...	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AB	1½	162*	own..	p-stl..	flex...	sol....	36x4	36x3½d	Sch...	wd...	own..	4-4 x5 -25.6	2	cent..	own..	sht...	own..	cel...	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AB	2	162*	own..	p-stl..	flex...	sol....	36x4	36x4d	Sch...	wd...	own..	4-4 x5 -25.6	2	cent..	own..	sht...	own..	cel...	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AB	2	162	own..	p-stl..	flex...	sol....	36x4	36x4d	Sch...	wd...	own..	4-4 x5 -25.6	2	cent..	own..	sht...	own..	cel...	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AC	3½	168*	own..	p-stl..	flex...	sol....	36x5	40x5d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack Tractor	AB	5	120	own..	p-stl..	flex...	sol....	36x4	36x4d	Sch...	wd...	own..	4-4 x5 -25.6	2	cent..	own..	sht...	own..	cel...	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AC	5	168*	own..	p-stl..	flex...	sol....	36x6	40x6d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AC	6½	168*	own..	p-stl..	flex...	sol....	36x6	40x12	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack Tractor	AC	7	119	own..	p-stl..	flex...	sol....	36x5	40x5d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack	AC	7½	168*	own..	p-stl..	flex...	sol....	36x7	40x7d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack Tractor	AC	10	119	own..	p-stl..	flex...	sol....	36x6	40x6d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack Tractor	AC	13	119	own..	p-stl..	flex...	sol....	36x6	40x12	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Mack Tractor	AC	15	119	own..	p-stl..	flex...	sol....	36x7	40x7d	Sch...	wd...	own..	4-5 x6 -40.0	2	cent..	own..	cst...	own..	ring..	sing..	Spltf..	hand..	sd-l-2..	L-N..	250
Maccar	L2	1½	150	Prsh..	p-stl..	s-flex..	sol....	36x4	36x6	Day..	mt...	Cont..	4-4½x5½-27.2	4	cent..	own..	cst...	Bush..	fin...	sing..	Eismn..	hand..	none..	.....	....
Maccar	H2	2½	162	Prsh..	p-stl..	s-flex..	sol....	36x4	36x4d	Day..	mt...	Cont..	4-4½x5½-32.4	2	cent..	own..	cst...	Bush..	fin...	sing..	Eismn..	hand..	none..	.....	....
Maccar	M2	3½	174	Prsh..	p-stl..	s-flex..	sol....	36x5	36x5d	Day..	mt...	Wsc..	4-4½x6 -32.4	4	cent..	own..	cst...	Bush..	fin...	sing..	Eismn..	hand..	none..	.....	....
Maccar	G	5	186	Prsh..	p-stl..	s-flex..	sol....	36x5	40x6d	Day..	mt...	Cont..	4-4½x6 -36.1	2	cent..	own..	cst...	Bush..	fin...	sing..	Eismn..	hand..	none..	.....	....
Master	JW	1½	142	P&B..	p-stl..	s-flex..	sol....	34x3½	34x5	Prud..	wd...	Buda..	4-4½x5½-27.2	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Master	D	2½	144	P&B..	p-stl..	s-flex..	sol....	34x4	36x7	Walk..	mt...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Master	W	2½	144	P&B..	p-stl..	s-flex..	sol....	34x4	36x7	Prud..	wd...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Master	A	3½	158	P&B..	p-stl..	s-flex..	sol....	36x5	40xdd	Prud..	wd...	Buda..	4-4½x6 -32.4	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	auto.	lghtg*.	.....	....
Master	B	5	170	P&B..	p-stl..	s-flex..	sol....	36x6	40x6d	Sth...	mt...	Buda..	4-4½x6½-36.1	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	auto.	lghtg*.	.....	....
Master	E	3½	158	P&B..	p-stl..	s-flex..	sol....	35x5	40x5d	Walk..	mt...	Buda..	4-4½x6 -32.4	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Master	F	5	170	P&B..	p-stl..	s-flex..	sol....	35x5	40x6d	Walk..	mt...	Buda..	4-4½x6½-36.1	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Master Tractor	T	6	110	P&B..	p-stl..	s-flex..	sol....	34x4	36x4d	Prud..	wd...	Buda..	4-4½x5½-29 0	4	cent..	own..	cst...	Chgo..	fin...	sing..	Eismn..	fixed.	lghtg*.	.....	....
Maxwell		1½	124	.....	p-stl..	rigid..	sol*..	32x3	32x4	.....	wd...	own..	4-3½x4½-21.0	4	ther..	own..	prs...	own..	fin...	sing..	.....	hand..	lghtg..	.....	none
Menges	B	2½	155	.....	rol-c..	.....	sol....	36x4	36x7	.....	mt...	Hink..	4-4½x5½-32 4	..	cent..	own..	.....	.....	.....	.....	Bosch.	.....	.....	.....	....
Menominee	HT	1	130	own..	rol-c..	s-flex..	sol....	34x3½	36x5	Stn...	wd...	Wsc..	4-3½x5 -22.5	4	cent..	own..	cst...	G&O..	fin...	sing..	Eismn..	hand..	lghtg.	Eismn.	....
Menominee	H	1½	144	own..	rol-c..	s-flex..	sol....	36x3½	36x5	Stn...	wd...	Wsc..	4-4 x5 -25.6	4	cent..	own..	cst...	G&O..	fin...	sing..	Eismn..	hand..	lghtg..	Eismn.	....
Menominee	D	2	144	own..	rol-c..	s-flex..	sol....	36x4	36x4d	Stn...	wd...	Wsc..	4-4 x6 -25.6	4	cent..	own..	cst...	G&O..	fin...	sing..	Eismn..	hand..	lghtg..	Eismn.	....
Menominee	G	3½	160	own..	rol-c..	rigid..	sol....	36x5	40x5d	Sth...	mt...	Wsc..	4-4½x6 -32.4	4	cent..	own..	cst...	G&O..	fin...	sing..	Eismn..	hand..	lghtg..	opt..	....
Menominee	J3	5	160	own..	rol-c..	rigid..	sol....	36x6	40x6d	Sth...	mt...	Wsc..	4-4½x6 -36.1	2	cent..	own..	cst...	G&O..	fin...	sing..	Eismn..	hand..	lghtg..	opt..	....
Moline	10	1½	130	Hyd..	p-stl..	flex...	pnu...	34x5	36x6	.....	wd...	own..	4-3½x5 -19.6	4	ther..	own..	cst...	Mod..	cel...	sing..	Spltf..	fixed.	.....	.....	....
Moreland	20N	1	132	Smh..	p-stl..	rigid..	pnu...	35x5	36x6	Drt...	mt...	Cont..	4-3½x5 -22.5	1	cent..	own..	.....	Mod..	fin...	sing..	Berlg..	hand..	.....	none.	....
Moreland	20B	1½	150	Smh..	p-stl..	rigid..	sol....	36x3½	36x6	Sth...	mt...	Cont..	4-4½x5½-27.2	1	cent..	own..	cst...	Mod..	fin...	sing..	Berlg..	hand..	.....	none.	....
Moreland	20C	2½	168	Smh..	p-stl..	rigid..	sol....	36x4	36x8	Sth...	mt...	Cont..	4-4½x5½-48.4	2	cent..	own..	cst...	Mod..	fin...	sing..	Berlg..	hand..	.....	none.	....
Moreland	20G	3½	186	Smh..	p-stl..	rigid..	sol....	36x5	40x5d	Sth...	mt...	Cont..	4-4½x6 -36.1	2	cent..	own..	cst...	Mod..	fin...	sing..	Berlg..	hand..	.....	none.	....
Moreland	20J	5	186	Smh..	p-stl..	rigid..	sol....	36x6	40x6d	Sth...	mt...	Cont..	4-4½x6 -36.1	2	cent..	own..	cst...	Mod..	fin...	sing..	Berlg..	hand..	.....	none.	....
Mutual	2B	2	152	S-K..	p-stl..	s-flex..	sol....	36x4	36x8	Sth...	mt...	Wsc..	4-4 x6 -25.6	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand..	sd-l-2..	West..	....
Mutual	2BP	2½	152	S-K..	p-stl..	s-flex..	pnu...	38x7..	42x9..	Day..	mt...	Wsc..	4-4 x6 -25.6	4	cent..	G&O..	cst...	G&O..	fin...	sing..	Bosch.	hand..	sd-l-2..	West..	....
Napoleon	9	1	132½	Trav..	rol-c..	s-flex..	sol*..	35x5*	35x5*	Roy...	wd...	Gray..	4-3½x5 -19.6	4	ther..	G&O..	cst...	G&O..	fin...	sing..	Eismn.	hand..	sl&i-..	G&D..	none
Napoleon	11	1½	132½	Trav..	rol-c..	s-flex..	sol*..	35x5*	36x6*	Roy...	wd...	Gray..	4-3½x5 -19.6	4	ther..	G&O..	cst...	G&O..	fin...	sing..	Eismn.	hand..	sl&i-..	G&D..	none
Napoleon	7	¾-1	121	.....	rol-c..	.....	pnu...	33x4	33x4	.....	wd...	H-S..	4-3½x5 -19.6	4	ther..	Lvgn..	.....	Lvgn..	fin...	sing..	Eismn.	hand.	sd-l.	.....	none
Nash	2018	1	130	Smh..	p-stl..	s-flex..	sol....	34x3	34x4	.....	wd...	own..	4-3½x5½-22 5	4	cent..	Lng...	cst...	Lng..	fin...	sing..	Eismn.	hand.	sl&i-2.	Aut-L.	none
Nash	3018	2	144	Smh..	p-stl..	s-flex..	sol....	34x4	34x6	.....	wd...	own..	4-3½x5½-22.5	4	cent..	Lng...	cst...	Lng..	fin...	sing..	Eismn.	hand.	sl&i-2.	Aut-L.	none
Netco	D	2	144	P&B..	p-stl..	s-flex..	sol*..	36x4*	36x7*	Arch..	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	cst...	E&M..	fin...	sing..	Eismn.	fixed	lghtg.	Eismn.	175
Netco	H	2½	168	P&B..	p-stl..	s-flex..	sol*..	36x4*	36x8*	Arch..	wd...	Cont..	4-4½x5½-32.4	2	cent..	own..	cst...	E&M..	fin...	sing..	Eismn.	fixed	lghtg.	Eismn.	175
New York	M	1½	144	own..	rol-c..	s-flex..	sol....	36x3½	36x5	Arch..	wd...	Cont..	4-4½x5½-27.2	4	cent..	Kells..	sht...	Kells..	cel...	sing..	Bosch.	fixed.	none.	.....	....
New York	N	2½	144	own..	rol-c..	s-flex..	sol....	36x4	36x4d	Arch..	wd...	Cont..	4-4½x5½-27.2	4	cent..	Kells..	sht...	Kells..	cel...	sing..	Bosch.	fixed.	none.	.....	....
Niles	E	2	140	Svg..	p-stl..	flex...	sol*..	36x4*	36x7*	H&D..	wd...	Cont..	4-4½x5½-27.2	4	cent.	Mod.	cst...	Mod.	sq-t...	sing..	Eismn.	hand.	lghtg..	Eismn.	none
Noble	A21	1	130	Shar..	p-stl..	s-flex..	pnu...	34x4½	35x5	Bim...	wd...	Lyc...	4-3½x5 -19.6	4	ther..	Lng...	prs...	Lng..	fin...	sing..	West..	hand.	sd-l-2..	West..	....
Noble	B30	1½	156	Shar..	p-stl..	s-flex..	sol*..	36x3½	36x5	Bim...	wd...	Buda..	4-3½x5½-22.5	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Eismn.	hand.	sd-l-2	West..	150
Noble	D50	2½	162	Shar..	p-stl..	s-flex..	sol*..	36x4	36x8	Bim...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Eismn.	hand.	sd-l-2.	West.	150
Noble	E70	3½	182	Shar..	p-stl..	s-flex..	sol....	36x5	36x10	Bim...	wd*..	Buda..	4-4½x6 -32.4	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Eismn.	hand.	lghtg.	West..	90
Norwalk	25E	1	130	P&B..	p-stl..	rigid..	sol....	34x3½	34x4	E&O..	wd...	Lyc...	4-3½x5 -19.6	4	ther..	Stan..	cst...	Stn...	cel...	sing..	Delco.	hand.	sl&i..	Dneto.	....
Norwalk	35E	1½	143	P&B..	p-stl..	rigid..	sol....	34x3½	34x5	E&O..	wd...	Lyc...	4-3½x5 -19.6	4	ther..	Stan..	cst...	Stn...	cel...	sing..	Delco.	hand.	sl&i.	Dneto.	....
Northway	B2	2	161	Drt...	p-stl..	s-flex..	sol*..	36x4	36x4d	Clrk..	mt...	own..	4-4 x6 -25.6	4	cent..	own..	cst...	G&O..	zz-t..	sing..	Wag..	hand.	sl&i-..	West..	none
Northway	B3	3½	160	Drt...	p-stl..	s-flex..	sol....	36x5	40x5d	Clrk..	mt...	own..	4-4 x6 -25.6	4	cent..	own..	cst...	G&O..	zz-t..	sing..	Wag..	hand.	sl&i-..	West..	none
Nye Tractor	B	8	....	own..	rol-c..	rigid..	sol....	40x7	none.	We-W.	wd...	Buda..	4-3½x5½-22.5	4	cent..	Idl..	prs...	Idl...	cel...	sing..	Spltf..	t-p...	none.	.....	....
Nye Tractor	C	5	....	own..	rol-c..	rigid..	sol....	40x6	none.	We-W.	wd...	Buda..	4-3½x5⅜-16.9	4	ther..	Idl...	prs...	Idl...	cel...	sing..	Spltf..	t-p...	none.	.....	....
Ogden	A1	1½	136	Cas..	p-stl..	flex...	opt....	36x3½	36x5	Stn...	wd...	Cont..	4-3½x5 -22.5	4	ther..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	.....	.....	....
Ogden	E	2½	160	Cas..	p-stl..	flex...	opt....	36x4	36x8	Stn...	wd...	Cont..	4-4½x5½-27.2	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	.....	.....	....
Orleans	A	1½	144	own..	rol-c..	s-flex..	sol*..	36x3½	36x5	Sth...	mt...	Her...	4-3½x5½-22.5	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Eismn.	hand.	lghtg.	.....	....
Orleans	B	2½	166	own..	rol-c..	s-flex..	sol*..	36x4	36x7	Sth...	mt...	Her...	4-4 x5½-25.6	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Eismn.	hand.	none.	.....	....
O.K.	HI	1½	150	Hyd..	p-stl..	s-flex..	pnu...	36x6	36x6	Bim...	wd...	Buda..	4-3½x5½-22.5	4	cent..	Chgo..	cst...	R-T..	fin...	sing..	Eismn.	hand.	sd-l.	West..	....
O.K.	KI	1½	150	Hyd..	p-stl..	s-flex..	pnu...	36x3½	36x7	Bim...	wd...	Buda..	4-4 x5½-25.6	4	cent..	Chgo..	cst...	R-T..	fin...	sing..	Eismn.	hand.	sd-l..	West..	100
O.K.	LI	2½	150	Hyd..	p-stl..	s-flex..	sol....	36x4	36x8	Bim...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Chgo..	cst...	R-T..	fin...	sing..	Eismn.	hand.	sd-l..	West..	100
O.K.	MI	3½	160	Hyd..	p-stl..	s-flex..	sol....	36x5	36x5-d	Bim...	wd...	Buda..	4-4½x6 -32.4	4	cent..	Chgo..	cst...	R-T..	fin...	sing..	Eismn.	hand.	sd-l..	West..	100
Old Hickory	W	1	135	own..	rol-c..	s-flex..	sol*..	36x3½	36x4	Stn...	wd...	Cont..	4-3½x5 -22.5	4	ther..	own..	cst...	Lng..	fin...	sing..	Eismn.	hand.	none.	.....	....
Old Reliable	A	1½	136	Smh..	p-stl..	s-flex..	sol*..	34x4	36x6	Crn...	wd...	Wsc..	4-4 x5 -25.6	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	lghtg.	Vesta.	....
Old Reliable	B	2½	160	own..	rol-c..	rigid..	sol....	34x4	36x4d	Crn...	wd...	Wsc..	4-4½x6 -29.0	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	lghtg..	Vesta.	....
Old Reliable	C	3½	160	own..	rol-c..	rigid..	sol....	36x5	36x5d	Crn...	wd...	Wsc..	4-4½x6 -29.0	4	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	lghtg.	Vesta.	....
Old Reliable	D	5	168	own..	rol-c..	rigid..	sol....	36x6	40x6d	Crn...	wd...	Wsc..	4-4½x6 -36.1	2	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	lghtg.	Vesta.	....
Old Reliable	K, L, M	7	136	own..	rol-c..	rigid..	sol....	36x6	40x7d	Crn...	wd...	Wau..	4-4½x6½-36.1	2	cent..	Chgo..	cst...	Chgo..	fin...	sing..	Bosch.	hand.	none.	.....	....
Oldsmobile-Economy	T	1	128	Smh..	p-stl..	rigid..	pnu...	35x5	35x5	Auto..	wd...	own..	4-3 5/16x5½-22.5	4	cent..	own..	prs...	own..	sq-t...	dual.	Aut-L.	hand.	sl&i-2.	Aut-L.	none
Oneida	A-9	1½	135	Drt...	p-stl..	s-flex..	sol....	36x3½	36x5	MWC.	wd...	own..	4-3½x5½-22.5	4	cent..	own..	cst...	Mod..	fin...	sing..	Spltf..	hand.	sd-l.	West..	....
Oneida	B-10	2	160	Drt...	p-stl..	s-flex..	sol....	36x4	36x7	MWC.	wd...	own..	4-4 x5½-25.6	4	cent..	own..	cst...	Mod..	fin...	sing..	Spltf..	hand.	sd-l.	West..	....
Oneida	C-9	2½	160	own..	p-stl..	s-flex..	sol*..	36x4	36x7	MWC.	wd...	own..	4-4 x5½-25.6	4	cent..	own..	cst...	Mod..	cel...	sing..	Spltf..	hand.	sd-l.	West..	110
Oneida	D-9	3½	170	own..	p-stl..	s-flex..	sol*..	36x5	36x10	Sth...	mt...	own..	4-4½x5½-32.4	4	cent..	own..	cst...	Mod..	cel...	sing..	Spltf..	hand.	sd-l.	West..	110
Oneida	E-9	5	180	own..	p-stl..	s-flex..	sol*..	36x6	40x12	Sth...	mt...	own..	4-4½x5½-32.4	4	cent..	own..	cst...	Mod..	cel...	sing..	Spltf..	hand.	sd-l.	West..	110
Packard	E-C	2	144	own..	rol-c..	flex...	sol....	36x4	36x7	.....	wd...	own..	4-4 3/16x5½-28.9	4	cent..	Fed..	cst...	Fed..	fin...	dual.	Spltf..	hand.	sl&i-2.	Bijur..	220
Packard	E-X	3	144	own..	rol-c..	flex...	pnu...	36x6	40x8	.....	mt...	own..	4-4 3/16x5½-28.9	4	cent..	Fed..	cst...	Fed..	fin...	dual.	Spltf..	hand.	sl&i-2.	Bijur..	220
Packard	E-D	4	156	own..	rol-c..	flex...	sol....	36x5..	36x5d	.....	mt...	own..	4-4½x5½-32.4	4	cent..	Fed..	cst...	Fed..	fin...	dual.	Spltf..	hand.	sl&i-2.	Bijur..	220
Packard	E-Y	5	156	own..	rol-c..	flex...	pnu...	38x7	44x10	.....	mt...	own..	4-5 x5½-40.0	4	cent..	Fed..	cst...	Fed..	fin...	dual.	Spltf..	hand.	sl&i-2.	Bijur..	220
Packard	E-F	6	156	own..	rol-c..	flex...	pnu...	36x6	40x6d	.....	mt...	own..	4-5 x5½-40.0	4	cent..	Fed..	cst...	Fed..	fin...	dual.	Spltf..	hand.	sl&i-2.	Bijur..	220
Paige	s2-19	1½	140	Hyd..	p-stl..	s-flex..	sol....	34x3½	34x6	Sch...	wd...	Hink..	4-4 x5½-25.6	4	cent..	own..	cst...	Natl..	fin...	sing..	Bosch.	hand.	sd-l.	G&D..	'xtra
Paige	54-20	2½	150	Hyd..	p-stl..	s-flex..	sol....	34x4	34x8	Day..	mt...	Hink..	4-4½x5½-29.0	4	cent..	Natl..	cst...	Natl..	fin...	sing..	Bosch.	hand.	sd-l-2..	G&D..	'xtra
Paige	51-18	3½	160	Hyd..	p-stl..	s-flex..	sol....	36x5	36x5d	Day..	mt...	Hink..	4-4½x5½-32.4	4	cent..	Natl..	cst...	Natl..	fin...	sing..	Bosch.	hand.	sd-l-2..	G&D..	'xtra
Parker	F-20	2	150	Smh..	p-stl..	flex...	sol....	34x4	36x4d	Bim...	wd...	Wsc..	4-4 x6 -25.6	4	cent..	own..	cst...	Brem.	pln...	sing..	Bosch.	hand.	sd-l-2..	West..	none
Parker	J-20	3½	160	Smh..	p-stl..	flex...	sol....	36x5	40x5d	Sth...	mt...	Wsc..	4-4½x6 -32.4	4	cent..	own..	cst...	Brem.	pln...	sing..	Bosch.	hand.	sd-l-2..	West..	none
Parker	M-20	5	160	Smh..	p-stl..	flex...	sol....	36x6	40x6d	Sth...	mt...	Wsc..	4-4½x6 -36.1	2	cent..	own..	cst...	Brem.	pln...	sing..	Bosch.	hand.	sd-l-2..	West..	none
Piedmont	4-30	1½	132	P&B..	p-stl..	rigid..	pnu...	34x4	34x4	E&O..	wd...	Lyc...	4-3½x5 -19.6	4	ther..	Stan..	cst...	Stan..	cel...	sing..	Delco.	hand.	sl&i-1.	Dneto.	none

For abbreviations see page 336.

oline Trucks—*Continued*

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE								STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By	Springs Make	Foot	Hand	Placed	Make	Levers	Type	Make	Name and Model
cent..	.....	motor.	1200	9	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	int-g..	own..	17.50	sprgs..	sprgs.	Morg.	ext-f-w.	ext-d-s.	l....	own..	ctr..	mtl	own....	MacDonald.....A
cent..	own...	motor.	1160	17	Schblr..	grv.	d-d...	own...	selec..	own...	mtr...	4	d-rd...	own..	7.60	sprgs..	sprgs.	Math*	int-r-w.	ext-d-s.	l....	own..	ctr..	mtl	Spicer..	Mack.....AB
cent..	own...	motor.	1160	19	Schblr..	grv.	d-d...	own...	selec..	own...	mtr...	4	hn...	own..	6.99	r-rd..	none.	Math*	ext-d-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AB
cent..	own...	motor.	1160	19	Schblr..	grv.	d-d...	own...	selec..	own...	mtr...	4	chn...	own..	6.99	r-rd..	none.	Math*	ext-d-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AB
cent..	own...	motor.	1160	17½	Schblr..	grv.	d-d...	own...	selec..	own...	mtr...	4	d-rd..	own..	7.60	sprgs..	sprgs.	Math*	int-r-w.	ext-d-s.	l....	own..	ctr..	mtl	Spicer..	Mack.....AB
cent..	own...	motor.	1000	14	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	8.49	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AC
cent..	own...	motor.	1160	12	Schblr..	grv.	d-d...	own...	selec..	own...	mtr...	4	chn...	own..	10.53	r-rd..	.....	Math*	ext-d-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack Tractor.....AB
cent..	own...	motor.	1000	13	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	9.00	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AC
cent..	own...	motor.	1000	10	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	10.50	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AC
cent..	own...	motor.	1000	11	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	10.76	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack Tractor.....AC
cent..	own...	motor.	1000	10	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	11.58	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack.....AC
cent..	own...	motor.	1000	10	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own..	11.58	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack Tractor.....AC
cent..	own...	motor.	1000	9½	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	cwn..	12.92	r-rd..	.....	Math*	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer..	Mack Tractor.....AC
cent..	own...	motor.	1000	8	Schblr..	grv.	d-p...	own...	selec..	own...	jst...	3	chn...	own.	14.10	r-rd..	.....	Math.	ext-j-s.	int-r-w.	l....	own..	ctr..	mtl	Spicer.	Mack Tractor.....AC
cent..	Pierce.	motor.	1250	17	Zenith*	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.75	r-rd..	sprgs..	Merl..	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Maccar.....L2
cent..	Pierce.	motor.	1200	16	Zenith*	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	7.75	r-rd..	sprgs .	Merl..	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Maccar.....H2
cent..	Pierce..	motor.	1200	15	Zenith*.	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.75	r-rd..	sprgs..	Merl.	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Maccar.....M2
l-b..	Cont..	motor.	1050	12	Zenith.	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.25	r-rd..	sprgs..	Merl..	int-r-w	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Maccar.....G
suct..	MeCn..	motor.	1200	15	Master.	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	7.75	sprgs..	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....JW
suct..	MeCn..	motor.	1200	16	Master.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	d-rd..	Torbn.	8.00	sprgs..	sprgs.	Dtr...	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....D
suct..	MeCn..	motor.	1200	15	Master.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Timkn	8.50	sprgs..	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....W
cent..	Pierce..	motor.	1100	12	Master.	vac.	w-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.33	sprgs*.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....A
cent..	Pierce..	motor.	1000	10	Master.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.25	sprgs*.	sprgs.	Dtr...	ext-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....B
cent..	Pierce..	motor.	1100	12	Master.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	d-rd...	Walkr.	11.50	sprgs*.	sprgs.	Dtr...	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....E
cent..	Pierce..	motor.	1000	10	Master.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	d-rd...	Walkr.	11.50	sprgs*.	sprgs.	Dtr...	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master.....F
suct..	MeCn..	motor.	1200	15	Master.	vac..	d-d...	Fuller*	selec..	Fuller*	mtr...	4	int-g..	Torbn.	8.60	sprgs..	sprgs.	Dtr...	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Master Tractor.....T
none..	.....	.....	1800	25	.....	grv.	cone.	own...	selec..	own...	mtr...	3	worm.	own..	7.25	sprgs..	sprgs.	.....	int-r-w.	int-r-w.	l....	own..	ctr..	fab	own....	Maxwell.....B
.....	.....	.....	.....	...	Stmbg..	.....	d-d...	Fuller.	.....	.....	.....	..	worm.	Wsc...	.....	t-arm.	t-arm.	Dplx..	.....	.....	l....	Ross.	.....	.....	.....	Menges.....B
suct..	Mnrch.	motor.	.....	20	Stmbg..	grv.	d-d...	Detlaf..	ind-c..	Cotta..	.....	3	worm.	Timkn	6.20	r-rd..	sprgs.	Tuth..	int....	int....	l....	Ross.	ctr..	f-m	Sp&O.	Menominee.....HT
suct..	Mnrch.	motor.	.....	16	Stmbg.	grv.	d-d...	Detlaf..	ind-c..	Cotta..	mtr...	3	worm.	Timkn	7.10	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sp&O	Menominee.....H
suct..	Mnrch.	motor.	.....	18	Stmbg.	grv.	d-d...	Detlaf.	ind-c..	Cotta..	mtr...	4	worm.	Timkn	7.75	r-rd..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sp&O	Menominee.....D
suct..	Mnrch.	motor.	.....	16	Stmbg.	grv.	d-d...	Detlaf.	ind-c..	Cotta..	amid..	4	worm.	Timkn	10.30	r-rd..	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Menominee.....G
suct..	Mnrch.	motor.	.....	...	Stmbg.	grv.	w-d...	Detlaf.	ind-c..	Cotta..	amid..	4	worm.	Timkn	11.66	r-rd..	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Menominee.....J3
.....	Phro..	motor.	1800	25	Till....	grv.	d-p...	.....	selec..	own...	mtr...	3	int-g..	Torbn.	8.00	sprgs.	sprgs.	Math.	int-r-w.	ext-r-w.	l....	Ross.	ctr..	mtl	Arvac..	Moline.....10
.....	.....	.....	.....	22	Master.	grv.	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	r-rd..	U.S..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own...	Moreland.....20N
.....	.....	.....	.....	26	Master.	grv.	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	r-rd..	U.S..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own...	Moreland.....20B
.....	.....	.....	.....	21	Master.	grv.	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	r-rd..	U.S..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own...	Moreland.....20C
.....	Cont..	motor.	1050	23	Master.	grv.	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	r-rd..	U.S..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own...	Moreland.....20G
.....	Cont..	motor.	1000	13	Master.	grv.	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	r-rd..	U.S..	int-r-w.	int-r-w.	l....	Ross.	ctr..	fab	own...	Moreland.....20J
cent..	Dplx..	Dplx..	1015	14	Stmbg.	grv.	w-d...	H-Shaw	ind-c..	Cotta..	amid..	4	worm.	Shel...	7.75	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	M&E..	Mutual.....2B
cent..	Dplx..	Dplx..	1240	20	Stmbg.	grv.	w-d...	H-Shaw	ind-c..	Cotta..	amid..	4	worm.	Shel...	7.75	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	M&E..	Mutual.....2BP
none..	.....	.....	1800	31	Schblr..	grv.	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	6.00	sprgs..	sprgs.	Math.	ext-r-w.	ext-d-s.	l....	Lavn..	ctr..	mtl	Unval..	Napoleon.....9
none..	.....	.....	1800	25	Schblr..	grv.	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	7.50	sprgs.	sprgs.	Math.	ext-r-w.	ext-d-s.	l....	Lavn..	ctr..	mtl	Unval..	Napoleon.....11
.....	.....	.....	.....	28	Scheb.	grv.	d-p...	B-Beck.	selec..	Muncie.	mtr...	3	int-g..	.....	6.00	.....	.....	.....	ext-r-w.	int-r-w.	o....	.....	.....	mtl	Hartf..	Napoleon.....7
cent..	Dplx..	motor.	1500	22	Stmbg.	grv.	d-p...	B-Beck.	selec..	Detrt..	mtr...	3	int-g.	Clrk..	6.80	sprgs..	sprgs.	Math.	ext-r-w.	ext-d-s.	l....	Lavn..	ctr..	mtl	own..	Nash.....2018
cent..	Dplx..	motor.	1500	17	Stmbg.	grv.	d-p...	B-Beck.	selec..	Detrt..	mtr...	4	int-g..	Clrk..	9.00	sprgs.	sprgs.	Math.	ext-r-w.	ext-d-s.	l....	Lavn..	ctr..	mtl	own..	Nash.....3018
none..	.....	.....	.....	24	Zenith.	grv.	d-d...	B-Lipe	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	Nelco.....D
none..	.....	.....	.....	24	Zenith.	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	.....	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	Nelco.....H
cent..	Pierce..	motor.	.....	18	Stmbg.	grv.	d-p...	B&B..	ind-c..	Cotta..	mtr...	3	worm.	Timkn	.....	r-rd..	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	Hart..	New York.....M
cent..	Pierce..	motor.	.....	15	.....	grv.	d-p...	B&B..	ind-c..	Cotta..	mtr...	3	.....	Timkn	.....	r-rd..	sprgs.	Merl..	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	Hart..	New York.....N
suct..	Mnrch	motor.	1200	15	Stmbg.	grv.	d-p...	B&B..	selec..	Covert.	amid..	3	worm.	Timkn	8.50	r-rd..	.....	Iron..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	Blood..	Niles.....E
none..	.....	.....	1500	26	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel...	6.00	sprgs..	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	M&E..	Noble.....A21
cent..	Amer..	motor.	1290	18	Stmbg.	grv.	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel...	7.75	sprgs.	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	M&E..	Noble.....B30
cent..	Amer..	motor.	1080	15	Stmbg.	grv.	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel...	8.75	sprgs.	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	M&E..	Noble.....D50
cent..	Amer..	motor.	972	12	Stmbg.	grv.	d-d...	Fuller..	selec..	Warner	amid..	4	worm.	Shel...	8.75	sprgs.	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Lavn..	ctr..	mtl	M&E..	Noble.....E70
.....	.....	.....	2200	30	Zenith.	vac..	d-d...	B&B..	selec..	G-Lees.	mtr...	3	worm.	Chic..	7.75	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	CAS..	ctr..	mtl	Unval.	Norwalk.....25E
.....	.....	.....	2200	35	Zenith.	vac..	d-d...	B&B..	selec..	G-Lees.	mtr...	3	worm.	Shel...	8.20	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	CAS.	ctr..	mtl	Unval.	Norwalk.....35E
cent..	Pierce..	motor.	1300	18	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Shel...	7.75	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Northway.....B2
cent..	Pierce..	motor.	1350	16	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Shel...	10.25	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer.	Northway.....B3
cent..	Pierce..	motor.	1100	4½	Stmbg.	grv.	d-d...	Fuller..	selec..	Fuller..	mtr...	3	chn...	own..	40.00	s-fr..	s-fr...	none.	ext-d-s.	ext-d-s.	l....	own..	ctr..	f-m	own...	Nye Tractor.....B
cent..	Pierce..	motor.	1100	4½	Stmbg.	grv.	d-d...	Fuller..	selec..	Fuller..	mtr...	3	chn...	own..	40.00	s-fr.	s-fr...	none.	ext-d-s.	ext-d-s.	l....	own..	ctr..	f-m	own...	Nye Tractor.....C
cent..	Pierce..	motor.	.....	15	Ray....	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel...	8.75	sprgs.	sprgs.	Tuth..	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	M&E..	Ogden.....A1
cent..	Pierce..	motor.	.....	15	Ray....	grv.	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel...	8.75	sprgs.	sprgs.	Tuth.	int-r-w.	int-r-w.	l....	Gem.	ctr..	mtl	M&E..	Ogden.....E
none..	.....	.....	.....	...	Mast...	grv.	d-d...	Detlaf.	ind-c..	Cotta..	mtr...	3	worm.	Wis...	7.25	r-rd..	t-arm.	Marm.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Blood..	Orleans.....A
none..	.....	.....	.....	...	Mast...	grv.	d-d...	Detlaf.	ind-c..	Cotta..	amid..	4	worm.	Wis...	8.50	r-rd..	t-arm.	Marm.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Blood..	Orleans.....B
none..	.....	.....	2200	35	Zenith.	vac..	d-d...	Fuller..	selec..	Fuller..	.....	3	worm.	Wis...	7.25	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	O K.....H1
none..	.....	.....	1600	21	Zenith.	vac..	d-d...	Fuller	selec..	Fuller..	.....	4	worm.	Wis...	13.20	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	O K.....K1
none..	.....	.....	1600	20	Zenith.	vac..	d-d...	Fuller	selec..	Fuller..	.....	4	worm.	Wis...	13.90	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	O K.....L1
none..	.....	.....	1600	17	Zenith.	vac..	d-d...	Fuller..	selec..	Fuller..	.....	4	worm.	Wis...	17.00	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Hart..	O K.....M1
cent..	Pierce..	motor.	1200	18	Stmbg.	vac..	d-p...	B&B..	selec..	G-Lees.	mtr...	3	worm.	Timkn	7.75	sprgs.	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Lavn.	ctr..	mtl	Blood..	Old Hickory.....W
suct..	Mnrch.	motor.	1135	15	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel...	7.75	sprgs.	sprgs.	Chgo..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Old Reliable.....A
suct..	Mnrch.	motor.	1135	15	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel...	7.75	sprgs.	sprgs.	Chgo.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Old Reliable.....B
suct..	Mnrch.	motor.	988	12	Stmbg.	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel...	8.75	r-rd..	sprgs.	Chgo..	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Old Reliable.....C
suct..	Mnrch.	motor.	1075	15	Stmbg.	vac..	w-d...	Unv...	selec..	own...	amid..	4	worm.	Shel...	10.25	r-rd..	sprgs.	Chgo.	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Old Reliable.....D
suct..	Wau..	motor.	995	14	Stmbg.	grv.	w-d...	Unv...	selec..	own...	jst....	4	chn...	own..	10.00	r-rd..	sprgs.	Chgo.	int-r-w.	ext-d-s.	l....	Ross.	l..	mtl	Hart..	Old Reliable....K, L, M
none..	.....	.....	2000	35	Zenith.	vac..	cone.	own...	selec..	Warn*	mtr...	3	int-g.	Torbn.	6.50	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Jacox.	r..	mtl	Spicer..	Olds-Economy.....T
cent..	own...	motor.	1400	27	Stmbg.	vac..	d-d...	own...	selec..	Fuller.	mtr...	3	worm.	own..	.....	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Pet	Oneida.....A-9
cent..	own...	motor.	1500	22	Stmbg.	vac..	d-d...	own...	selec..	Fuller.	mtr...	3	worm.	own..	.....	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	Ross.	ctr..	f-m	Sp&Pet	Oneida.....B-10
cent..	own...	motor.	1400	20	Stmbg.	vac..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	.....	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	own..	ctr..	f-m	own...	Oneida.....C-9
cent..	own...	motor.	1350	14	Stmbg.	vac..	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	own..	ctr..	f-m	own...	Oneida.....D-9
cent..	own...	motor.	1350	14	Stmbg.	vac..	d-d...	own...	selec..	own...	amid..	4	worm.	Timkn	.....	r-rd..	sprgs.	Math.	int-r-w.	int-r-w.	l....	own..	ctr..	f-m	own...	Oneida.....E-9
cent..	own...	motor.	1000	15	own...	pres..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	7.25	r-rd..	t-arm.	Sp-P..	ext-d-s.	int-r-w.	l....	own..	l&c.	f-m	own&Sp	Packard.....E-C
cent..	own...	motor.	1800	28	own...	pres..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	7.25	r-rd..	t-arm.	Sp-P..	ext-d-s.	int-r-w.	l....	own..	l&c.	f-m	own&Sp	Packard.....E-X
cent..	own...	motor.	1000	12	own...	pres..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	9.00	r-rd..	t-arm.	Sp-P.	ext-d-s.	int-r-w.	l....	own..	l&c.	f-m	own&Sp	Packard.....E-D
cent..	own...	motor.	1600	25	own...	pres..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	9.00	r-rd..	t-arm.	Sp-P..	ext-d-s.	int-r-w.	l....	own..	l&c.	f-m	own&Sp	Packard.....E-Y
cent..	own...	motor.	1000	11	own...	pres..	d-d...	own...	selec..	own...	amid..	4	worm.	own..	10.66	r-rd..	t-arm.	Sp-P..	ext-d-s.	int-r-w.	l....	own..	l&c.	f-m	own&Sp	Packard.....E-F
cent..	.....	motor.	1400	18	Stmbg.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	7.75	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Paige.....52-19
cent..	Simp..	motor.	1250	15	Stmbg.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel...	8.75	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Paige.....54-20
cent..	Simp..	motor.	1200	12	Stmbg.	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	10.33	r-rd..	sprgs.	S-P...	int-r-w.	int-r-w.	l....	Ross.	ctr..	mtl	Spicer..	Paige.....51-18
suct..	Mnrch.	motor.	1050	15	Stmbg.	grv.	d-d...	B-Lipe.	selec..	Fuller.	amid..	4	worm.	own..	7.75	r-rd..	sprgs.	Tuth..	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Blood..	Parker.....20-F
suct..	Mnrch.	motor.	1050	15	Stmbg.	grv.	d-d...	B-Lipe.	selec..	Warn..	amid..	4	worm.	own..	8.75	r-rd..	sprgs.	Tuth..	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Blood..	Parker.....20-J
cent..	Simp..	motor.	1050	12	Stmbg.	grv.	d-d...	B-Lipe.	selec..	Warn..	amid..	4	worm.	Timkn	10.25	r-rd..	sprgs.	Tuth..	ext-d-s.	int-r-w.	l....	Ross.	ctr..	mtl	Blood..	Parker.....20-M
none..	.....	.....	2200	20	Cart...	vac..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	worm.	Dunk.	.....	sprgs.	sprgs.	S-P...	ext-r-w.	int-r-w.	l....	Lavn..	r....	mtl	Spicer..	Piedmont.....4-30

For abbreviations see page 336.

Specifications of Gas

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME			TIRES			WHEELS		ENGINE													
							Size in Ins.							COOLING					IGNITION			ELEC. SYSTEM		
															RADIATOR									
															CASE		CORE							
			Make	Material	Type	Kind	Front	Rear	Make	Type	Make	No. Cyl. Bore and Stroke—N.A.C.C. Hp.	Cylinders Cast	Water Circ.	Make	Type	Make	Type	Type	Make	Spark Advance	Type	Make	Extra Cost $
Pierce-Arrow	2	150	.....	p-stl..	s-flex..	sol....	36x4	36x4d	.....	mt....	own..	4-4x 5½-25.6	4	cent..	.....	cst....	.....	fin....	t-p....	Delco.	hand..	sl&i-2.	Delco.	125
Pierce-Arrow	3½	162	.....	p-stl..	s-flex..	sol....	36x5	36x5d	.....	mt....	own..	4-4½x6½-32.4	4	cent..	.....	cst....	.....	fin....	t-p....	Delco.	hand..	sl&i-2.	Delco.	125
Pierce-Arrow	5	168	.....	p-stl..	s-flex..	sol....	36x5	40x6d	.....	mt....	own..	4-4½x6½-32.4	4	cent..	.....	cst....	.....	fin....	t-p....	Delco.	hand..	sl&i-2.	Delco.	125
Pioneer.....AA	1	130	Cas..	p-stl..	.....	pnu...	33x5	33x5	Bim..	wd...	GB&S.	4-3⅜x4½-22.5	4	ther..	Wab..	sht...	Wab..	cel....	sing..	Bosch.	hand..	s&l-2.	A-L..	none
Pittsburger.....B	2½	160	own..	p-stl..	s-flex..	sol*...	36x5	36x7	Sth...	mt....	Cont..	4-4½x5½-27.3	4	cent..	own..	cst....	G&O..	fin....	sing..	Bosch.	hand..	none..	.....	.....
Pony.....	¼	92	own..	rol-c..	s-flex..	pnu...	28x3	28x3	Prud..	wd...	own..	4-2¾x4 -12.1	4	ther..	own..	.....	own..	cel....	sing..	A-Knt	auto..	none..	.....	.....
Ranger.....TK	2	136	Drt...	rol-c..	rigid..	pnu...	36x6	38x7	Crn...	wd...	Wsc..	4-3¾x5 -22.5	4	cent..	Bush..	cst....	Bush..	fin....	sing..	Spltf..	hand..	.....	.....	.....
Rainier.....R-11	¾	125	Prsh..	p-stl..	s-flex..	pnu...	35x5	35x5	Way..	wd...	Cont..	4-3½x5 -19.6	4	ther..	Har...	prs...	Har...	cel....	sing..	Eismn.	fixed..	lghtg..	.....	.....
Rainier.....R-19	1	135	Prsh..	p-stl..	s-flex..	sol....	34x3½	34x4	Way..	wd...	Cont..	4-3½x5 -19.6	4	ther..	Har...	prs...	Har...	cel....	sing..	Eismn.	fixed..	lghtg..	.....	.....
Rainier.....R-16	1½	147	Prsh..	p-stl..	s-flex..	sol....	34x3½	34x5	Way..	wd...	Cont..	4-3½x5 -22.5	4	ther..	Har...	prs...	Har...	cel....	sing..	Eismn.	fixed..	lghtg..	.....	.....
Rainier.....R-18	2	147	Prsh..	p-stl..	s-flex..	sol....	34x4	34x6	Way..	wd...	Cont..	4-4½x5½-27.2	4	cent..	E&M.	cst....	E&M.	fin....	sing..	Eismn.	hand..	lghtg..	.....	.....
Rainier.....R-20	2½	165	Prsh..	p-stl..	s-flex..	sol....	34x4	34x7	Way..	wd...	Cont..	4-4½x5½-27.2	4	cent..	E&M.	cst....	E&M.	fin....	sing..	Eismn.	hand..	lghtg..	.....	.....
Rainier.....R-15	3½	170	Prsh..	p-stl..	s-flex..	sol....	36x5	36x5d	Way..	wd...	Cont..	4-4½x5½-32.4	2	cent..	E&M.	cst....	E&M.	fin....	sing..	Eismn.	hand..	lghtg..	.....	.....
Rainier.....R-17	5	175	Prsh..	p-stl..	s-flex..	sol....	36x6	36x6d	Way..	mtl..	Cont..	4-4¾x6 -36.1	2	cent..	E&M.	cst....	E&M.	fin....	sing..	Eismn.	hand..	lghtg..	.....	.....
Reliance.....20B	2½	156	Savg..	p-stl..	flex..	sol....	36x4	36x4d	Stn...	wd...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst....	Bush..	pln....	sing..	Eismn.	hand..	lghtg..	Eismn.	none
Reliance.....10A	1½	150	Savg..	p-stl..	flex..	sol....	36x3½	36x5	Stn...	wd...	Buda..	4-4 x5½-25.6	4	cent..	own..	cst....	Bush..	pln....	sing..	Eismn.	hand..	lghtg..	Eismn.	none
Reo.....F	¾	128	own..	p-stl..	.....	pnu...	34x4½	34x4½	Prud..	wd...	own..	4-4½x4½-27.2	2	cent..	own..	prs....	own..	fin....	.....	.....	hand..	.....	.....	.....
Republic.....10E	1	124	Drt...	p-stl..	s-flex..	pnu...	35x5	35x5	MWC.	wd...	Cont..	4-3½x5 -22.5	4	ther..	own..	cst....	G&O..	cel....	sing..	Bosch.	fixed..	lghtg..	Delco.	.....
Republic.....11X	1½	144	Drt...	p-stl..	s-flex..	sol....	34x3½	34x5	MWC.	wd...	Cont..	4-3½x5 -22.5	4	ther..	own..	cst....	G&O..	cel....	sing..	Bosch.	fixed..	s&l..	Aut-L.	275
Republic.....19	2½	144	Drt...	p-stl..	s-flex..	pnu...	36x4	36x7	MWC.	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	cst....	G&O..	cel....	sing..	Bosch.	hand..	s&l..	West..	275
Republic.....20	3½	165	Drt...	p-stl..	s-flex..	pnu ..	36x5	36x10	Sth...	mt....	Cont..	4-4½x5½-32.4	2	cent..	own..	cst....	G&O..	fin....	sing..	Bosch.	hand..	lghtg..	West..	165
Riker.....B	3	150	Prsh..	p-stl..	rigid..	sol....	36x5	36x5d	Day..	mt....	own..	4-4½x6 -29.0	2	cent..	own..	cst....	MeC..	fin....	dual..	Berlg..	.....	s&l..	West..	.....
Riker.....BB	4	150	Prsh..	p-stl..	rigid..	sol....	36x5	36x6d	Day..	mt....	own..	4-4½x6 -29.0	2	cent..	own..	cst....	MeC..	fin....	dual..	Berlg..	.....	s&l..	West..	.....
Rock Falls.....14	....	150	Smh..	p-stl..	.....	pnu...	35x5	35x5	Mut..	wd...	Cont..	6-3½x5 -33.75	6	cent..	.....	prs....	S-W..	zz-t..	sing..	Bosch.	hand..	s&l..	West.	none
Rowe.....CW	1½	133	own..	rol-c..	s-flex..	pnu...	36x6	36x6	H&D.	wd...	Wsc..	4-3¾x5 -22.5	4	cent..	E&M*	sht...	E&M*	cel....	sing..	Bosch.	hand..	none..	.....	.....
Rowe.....CDW	2	140	own..	rol-c..	s-flex..	sol....	34x4	36x3½	H&D.	wd...	Wsc..	4-4 x5 -25.4	4	cent..	E&M*	sht...	E&M*	cel....	sing..	Bosch.	hand..	none..	.....	.....
Rowe.....GSW	3	158	own..	rol-c..	s-flex..	sol....	34x5	36x5d	H&D.	wd...	Wsc..	4-4 x6 -25.4	4	cent..	E&M*	sht...	E&M*	cel....	sing..	Bosch.	hand..	none..	.....	.....
Rowe.....GPW	3	170	own..	rol-c..	s-flex..	pnu...	38x7	42x9	H&D.	wd...	Pitt..	8-3½x5 -33.8	4	cent..	E&M*	sht...	E&M*	cel....	sing..	A Knt	hand..	sl&i-2.	West.	none
Rowe.....HW	4	158	own..	rol-c..	s-flex..	sol....	36x5	36x6d	H&D.	wd...	Wsc..	4-4½x6 -29.0	4	cent..	E&M*	sht...	E&M*	cel....	sing..	Bosch.	hand..	none	.....	.....
Rowe.....FW	5	170	own..	rol-c..	s-flex..	sol....	36x6	40x6d	H&D.	wd...	Wsc..	4-4½x6 -32.4	4	cent..	E&M*	sht...	E&M*	cel....	sing..	Bosch.	hand..	none..	.....	.....
Rumely.....A	1½	144	Hyd..	p-stl..	s-flex..	sol....	36x3½	36x5	MWC.	wd...	Buda..	4-3¾x5½-22.5	4	cent..	Mod..	cst....	Mod..	fin....	sing..	Spltf..	hand..	none..	.....	.....
Sandow.....G	1	120	Savg..	p-stl..	flex...	sol....	34x3½	34x5	Stn...	wd...	Cont..	4-3¾x5 -22.5	4	ther...	own..	cst....	Chgo..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	125
Sandow.....CG	1½	135	Elyr..	p-stl..	s-flex..	sol....	34x4	34x6	Stn...	wd...	Cont..	4-3¾x5 -22.5	4	cent..	own..	cst....	Chgo..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	125
Sandow.....J	2½	165	Elyr..	p-stl..	rigid..	sol....	36x4	36x7	Stn...	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	cst....	Chgo..	fin....	sing..	Bosch.	hand..	lghtg..	Vesta.	125
Sandow.....M	3½	175	Elyr..	p-stl..	rigid..	sol....	36x5	36x5d	Stn...	wd...	Cont..	4-4½x5½-32.4	2	cent..	own..	cst....	Chgo..	fin....	sing..	Bosch.	hand..	lghtg..	Vesta.	125
Sandow.....L	5	175	Elyr..	p-stl..	rigid..	sol....	36x6	40x6d	Stn...	wd...	Cont..	4-4½x5½-32.4	2	cent..	own..	cst....	Chgo..	fin....	sing..	Bosch.	hand..	.....	.....	125
Sanford.....W25	2½	156	P&B..	p-stl..	s-flex..	sol*...	36x4	36x4d	H&D.	wd...	Cont..	4-4½x5½-27.2	4	cent..	own..	cst....	MeC..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	150
Sanford.....W35	3½	174	P&B..	p-stl..	s-flex..	sol....	36x5	36x5d	H&D.	wd...	Cont..	4-4½x5½-32.4	2	cent..	own..	cst....	MeC..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	150
Sanford.....W50	5	174	P&B..	p-stl..	s-flex..	sol....	36x5	40x6d	Sth...	mt....	Cont..	4-4½x6 -36.1	2	cent..	own..	cst....	MeC..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	150
Schacht	2	156	own..	rol-c..	flex...	sol....	36x4	36x7	Crn...	wd...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst....	Brem.	fin....	sing..	Bosch.	hand..	.....	.....	.....
Schacht	2½	156	own..	rol-c..	flex...	sol....	36x4	36x4d	Crn...	wd...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst....	Brem.	fin....	sing..	Bosch.	hand..	.....	.....	.....
Schacht	3½	168	own..	rol-c..	flex...	sol....	36x5	36x5d	Crn...	wd...	Buda..	4-4½x6 -29.0	4	cent..	own..	cst....	Brem.	fin....	sing..	Bosch.	hand..	.....	.....	.....
Schacht	5	168	own..	rol-c..	flex...	sol....	36x5	40x6d	Crn...	wd...	Buda..	4-4½x6 -32.4	4	cent..	own..	cst....	Brem.	fin....	sing..	Bosch.	hand..	.....	.....	.....
Selden.....1½ A	1½	137½	own..	p-stl..	s-flex..	sol....	34x3½	34x5	Arch..	wd...	Cont..	4-3½x5 -22.5	4	ther..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	fixed..	s&l-2.	N-E.	.....
Selden.....2½ A	2½	145	own..	p-stl..	s-flex..	sol....	36x4	36x7	Stn...	mt....	Cont..	4-4½x5½-27.3	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l-2.	N-E.	.....
Selden.....3½ A	3½	162	own..	p-stl..	s-flex..	sol....	36x5	36x10	Stn...	mt....	Cont..	4-4½x5½-32.4	2	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l-2.	N-E.	.....
Selden.....5A	5	164	own..	p-stl..	s-flex..	sol....	36x6	40x12	Stn...	mt....	Cont..	4-4¾x6 -36.1	2	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l-2.	N-E.	.....
Seneca.....M20	½	108	P&B..	p-stl..	flex...	pnu...	30x3½	30x3½	Day..	wd...	LeR..	4-3 x4½-15.6	4	ther..	Kug...	prs....	Kug...	cel....	sing..	Conn..	hand..	sl&i..	Al-Ch.	none
Service.....220	1-1½	137	own..	p-stl..	flex...	sol....	34x3½	34x5	Bim...	wd...	Buda..	4-3½x5½-19.6	4	ther..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....31	1½-2	150	own..	p-stl..	flex...	sol....	36x3½	36x6	Bim...	wd...	Buda..	4-4 x5½-25.6	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....36	1½-2	150	own..	p-stl..	flex...	pnu...	35x5	38x7	Bim...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....51	2½-3	160	own..	p-stl..	flex...	sol*...	36x4	36x7	Bim...	wd...	Buda..	4-4½x5½-29.0	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....71	3½-4	171	own..	p-stl..	flex...	sol*...	36x5	36x5d	Stn...	mt....	Buda..	4-4½x5½-29.0	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....76	3½-4	171	own..	p-stl..	flex...	sol....	36x5	36x5d	Stn...	mt....	Buda..	4-4½x6 -32.4	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....101	5-6	171½	own..	p-stl..	flex...	sol....	36x6	40x6d	Stn...	mt....	Buda..	4-4½x6 -32.4	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	s&l..	West.	230
Service.....15	¾-1	132	own..	p-stl..	.....	pnu...	34x4½	35x5	.....	wd...	Mid-w	4-3¾x5 -21.03	4	cent..	.....	sht...	.....	fin....	sing..	Remy.	hand..	s&l..	Remy.	none
Signal.....NF	1	132	Drt...	p-stl..	s-flex..	pnu...	34x5	36x6	Kel..	wd...	Cont..	4-3¾x5 -22.5	4	cent..	MeC..	cst....	MeC..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Signal.....H	1½	146	Savg..	p-stl..	s-flex..	sol....	34x4	36x6	Crn...	wd...	Cont..	4-4½x5½-27.2	4	cent..	MeC..	cst....	MeC..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Signal.....J	2½	150	Savg..	p-stl..	s-flex..	sol....	34x4	36x8	Crn...	wd...	Cont..	4-4½x5½-27.2	4	cent..	MeC..	cst....	MeC..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Signal.....M	3½	168	Savg..	p-stl..	s-flex..	sol....	36x5	40x5d	Crn...	wd...	Cont..	4-4½x5½-32.4	2	cent..	MeC..	cst....	MeC..	fin....	sing.	Eismn.	fixed..	none...	.....	.....
Signal.....R	5	180	Savg..	p-stl..	s-flex..	sol....	36x6	40x6d	Sth*.	mt*..	Cont..	4-4½x6 -36.1	2	cent..	MeC..	cst....	MeC..	fin....	sing..	Eismn.	hand..	none..	.....	.....
Southern.....10	1	136	P&B..	p-stl..	s-flex..	opt....	34x4½	34x4	Roy...	wd...	Buda..	4-3¾x5 -22.5	4	ther..	own..	cst....	R-T..	fin....	sing..	Bosch.	fixed..	none..	.....	.....
Southern.....15	1½	146	P&B..	p-stl..	s-flex..	opt....	36x6	34x4	Roy...	wd...	Cont..	4-3½x5½-22.5	4	ther..	own..	cst....	R-T..	fin....	sing..	Bosch.	fixed..	none..	.....	.....
Southern.....20	2	150	own..	rol-c..	s-flex..	opt....	36x6	40x8	Roy...	wd...	Buda..	4-4 x5½-25.6	4	cent..	own..	cst....	R-T..	fin....	sing..	Bosch.	fixed..	none..	.....	.....
Standard.....1K	1	134	Prsh..	p-stl..	s-flex..	pnu...	36x6	36x6	.....	wd...	Cont..	4-3¾x5 -22.5	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Standard.....76	2½	140	own..	rol-c..	s-flex..	sol*...	36x4	36x7	.....	wd...	Cont..	4-4½x5½-27.2	4	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Standard.....66	3½	160	P&B..	p-stl..	s-flex..	sol....	36x5	36x5d	.....	wd...	Cont..	4-4½x5½-32.4	2	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Standard.....5K	5	164	Smh..	p-stl..	s-flex..	sol....	36x6	40x6d	Day..	mt....	Cont..	4-4¾x6 -36.1	2	cent..	Lng...	cst....	Lng...	fin....	sing..	Eismn.	hand..	none..	.....	.....
Sterling	1½	142	own..	p-stl..	.....	sol*...	36x3½	36x5	Prud*	wd*..	own..	4-4 x5½-25.6	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	s&l-2.	West.	.....
Sterling	2½	156	own..	p-stl..	flex...	sol*...	36x4	36x4	Prud*	wd*..	own..	4-4½x5½-30.6	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	s&l-2.	West.	.....
Sterling	3½	162	own..	p-stl..	flex...	sol*...	36x5	40x5d	Prud*	wd*..	own..	4-4½x6½-32.4	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	s&l-2.	West.	.....
Sterling	5	168	own..	p-stl..	flex...	sol*...	36x6	40x6d	Prud*	wd*..	own..	4-5 x6½-40.0	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	s&l-2.	West.	.....
Sterling	5	174	own..	p-stl..	flex...	sol....	36x6	40x6d	Sth...	mt....	own..	4-5 x6½-40.0	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	sl&i..	West.	.....
Sterling	7½	174	own..	p-stl..	flex...	sol....	36x6	40x7d	Sth...	mt....	own..	4-5 x6½-40.0	2	cent..	own..	cst....	.....	cel....	sing..	Eismn.	hand..	sl&i..	West.	.....
Stewart.....11	¾	110	Hyd..	p-stl..	rigid..	pnu...	32x4	32x4	Way..	wd...	LeR..	4-3½-4½-15.6	4	ther..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	fixed..	sl&i-2.	Eismn.	none
Stewart.....12	1	130	Hyd..	p-stl..	rigid..	pnu...	35x5	35x5	Way..	wd...	H-S..	4-3½x5 -19.6	4	ther..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	hand..	sl&i-2.	Eismn.	none
Stewart.....9	1½	140	Hyd..	p-stl..	rigid..	sol....	34x3½	34x5	Way..	wd...	Cont..	4-3¾x5 -22.5	4	ther..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Stewart.....7	2	156	Hyd..	p-stl..	rigid..	sol....	34x4	34x7	Clrk..	mt....	Cont..	4-4½x5½-27.2	4	cent..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Stewart.....7x	2½	156	Hyd..	p-stl..	rigid..	sol....	34x4	34x7	Clrk..	mt....	Buda..	4-4½x5½-29.0	4	cent..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	hand..	none..	.....	.....
Stewart.....10	3½	165	Hyd..	p-stl..	rigid..	sol....	36x5	36x5d	Clrk..	mt....	Cont..	4-4½x5½-32.4	2	cent..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	fixed..	none..	.....	.....
Stewart.....10x	3½	165	Hyd..	p-stl..	rigid..	sol....	36x5	36x5d	Clrk..	mt....	Buda..	4-4½x6 -32.4	4	cent..	Bush..	cst....	Bush..	fin....	sing..	Eismn.	hand..	none..	.....	.....
Stoughton.....A	1	130	Drt...	p-stl..	flex...	pnu...	34x4½	35x5	Bim...	wd...	Wau..	4-3½x5½-22.5	4	cent..	own..	cst....	Chgo..	fin....	sing..	Eismn.	hand..	s&l..	West.	.....
Stoughton.....B	1½	140½	.....	p-stl..	flex...	sol....	36x3½	36x5	Bim...	wd...	Wau..	4-3½x5½-22.5	4	cent..	own..	cst....	Chgo..	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	110
Stoughton.....D	2	140½	Drt...	p-stl..	flex...	sol....	36x4	36x7	Bim...	wd...	Her..	4-4 x5½-25.6	4	cent..	own..	cst....	Chgo.	fin....	sing..	Eismn.	hand..	lghtg..	Vesta.	110
Sullivan.....E	2	150	P&B..	p-stl..	s-flex..	sol*...	36x4	36x7	Way..	wd...	Buda..	4-4½x5½-29.0	4	cent..	own..	cst....	Bush.	fin....	sing..	Bosch.	hand..	.....	.....	.....
Sullivan.....H	3½	170	P&B..	p-stl..	s-flex..	sol....	36x5	36x5d	Way..	wd...	Buda..	4-4½x6 -32.4	4	cent..	own..	cst....	R-T..	fin....	sing..	Bosch.	hand..	.....	.....	.....
Super-Truck.....50	2½	156	P&B..	p-stl..	flex...	sol....	36x4	36x8	Prud.	wd...	Wsc..	4-4 x6 -25.6	4	cent..	Chgo.	cst....	Chgo.	fin....	sing..	Bosch.	hand..	lghtg..	Vesta.	50
Super-Truck.....70	3½	164	P&B..	p-stl..	flex...	sol....	36x	40x5d	Sth...	mt....	Wsc..	4-4½x6 -29.0	4	cent..	Chgo.	cst....	Chgo.	fin....	sing..	Splt..	hand..	lghtg..	Vesta.	50
Super-Truck.....100	5	164	P&B..	p-stl..	flex...	sol....	36x5	40x12	Sth...	mt....	Wsc..	4-4½x6 -36.1	2	cent..	Chgo.	cst....	Chgo.	fin....	sing..	Splt..	hand..	lghtg..	Vesta.	50
Texas.....1921	¾	115	P&B..	p-stl..	rigid..	pnu...	33x4	33x4	Stn...	wd...	Lyc...	4-3½x5 -19.6	4	ther..	Jmst..	prs....	Jmst..	cel....	sing..	Conn..	hand..	s, l & i.	Bijur.	.....
Tiffin.....F15	1½	135	P&B..	p-stl..	flex...	sol....	36x3½	36x5	Sth...	mt....	Cont..	4-4½x5½-27.2	4	cent..	own..	cst....	B&O..	fin....	sing..	Bosch*	hand..	s&l-2..	West..	175
Tiffin.....F25	2½	148	P&B..	p-stl..	flex...	sol....	36x4	36x3½d	Sth...	mt....	Cont..	4-4½x5½-27.2	4	cent..	own..	cst....	B&O..	fin....	sing..	Bosch*	hand..	s&l-2..	West..	175
Tiffin.....F35	3½	160	own..	rol-c..	s-flex..	sol....	36x5	40x5d	Sth...	mt....	Cont..	4-4½x5½-32.4	2	cent..	own..	cst....	B&O..	fin....	sing..	Bosch*	hand..	s&l-2..	West..	175

For abbreviations see page 336.

oline Trucks—*Continued*

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE								STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By	Springs Make	Foot	Hand	Placed	Make	Levers	Type	Make	Name and Model
cent.	own.	motor	1400	18	Stmbg.	pres.	d-d.		selec.		amid.	4	worm		9.66	sprgs.	sprgs.		int-r-w.	int-r-w.	l.		ctr.	f-m		Pierce-Arrow
cent.	own.	motor	1200	16	Stmbg.	pres.	d-d.		selec.	own.	amid.	4	worm	own.	8.00	r-rd.	t-arm		ext-d-s.	int-r-w.	l.		ctr.	f-m		Pierce-Arrow
cent.	own.	motor	1200	14	Stmbg.	pres.	d-d.		selec.	own.	amid.	4	worm	own.	10.00	r-rd.	t-arm		ext-d-s.	int-r-w.	l.		ctr.	f-m		Pierce-Arrow
none.			1000	22	Zenith.	vac.	d-d.	Drt.	selec.	G-Lees.	mtr.	3	worm	Iron.	6.00	sprgs.	sprgs.	GCS.	int-r-w.	int-r-w.	l.	Wol.	ctr.	fab	On&No	Pioneer AA
suct.	Mnrch.	motor	1264	15	Stmbg.	vac.	d-d.	B-Lipe.	prog.	B-Lipe.	mtr.	4	worm	Shel.	8.75	r-rd.	sprgs.	Iron.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Pittsburger B
none.			1500	30	Stmbg.	grv.					amid.	3	chn.	own.	4.00	r-rd.		Tuth.	int-r-w.	int-d-s.		own.		mtl	own.	Pony
cent.	Dplx.	motor	1600	12	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Timkn	9.25	r-rd.	sprgs.	Stand.	int-r-w.	int-r-w.	l.	Ditw.	ctr.	mtl	Unvsl.	Ranger TK
suct.	Mnrch.	motor		25	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Timkn		sprgs.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Lavn.	ctr.	mtl	Spicer.	Rainier R-11
suct.	Mnrch.	motor		20	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Shel.		sprgs.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Lavn.	ctr.	mtl	Spicer.	Rainier R-19
suct.	Mnrch.	motor		18	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Shel.		sprgs.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Lavn.	ctr.	mtl	Spicer.	Rainier R-16
cent.	Pierce.	motor		16	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Shel.		sprgs.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Rainier R-18
cent.	Pierce.	motor		16	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn		r-rd.	sprgs.	Sp-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Rainier R-20
cent.	Pierce.	motor		15	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn		r-rd.	sprgs.	Sp-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Rainier R-15
cent.	Pierce.	motor		15	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn		r-rd.	sprgs.	Sp-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Rainier R-17
cent.	Pierce.	motor	1000	14	Stmbg.	grv.	d-d.	Fuller.	ind-c.	Cotta.	amid.	4	ext-g.	Badg.	7.50	sprgs.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Pet.	Reliance 20B
cent.	Pierce.	motor	1000	18	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	ext-g.	Badg.	6.60	sprgs.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Pet.	Reliance 10A
					John.	grv.	d-d.	own.	selec.	own.	amid.	3	bevel.	own.	4.70	sprgs.	t-arm	Penn.	int-r-w.		l.	own.	ctr.	f-m	own.	Reo F
			1500	25	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	int-g.	Torbn.	6.28	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l.	Jacox.	ctr.	mtl	Hart.	Republic 10E
suct.	own.	motor	1350	17	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	int-g.	Torbn.	8.00	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l.	Jacox.	ctr.	mtl	Hart.	Republic 11X
cent.	Phro.	motor	1125	15	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	int-g.	Torbn.	8.00	sprgs.	sprgs.	Math.	ext-r-w.	int-r-w.	l.	Jacox.	ctr.	mtl	Hart.	Republic 19
cent.	Phro.	motor	1200	13	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	int-g.	Torbn.	10.26	sprgs.	sprgs.	Math.	int-r-w.	int-r-w.	l.	Jacox.	ctr.	mtl	Hart.	Republic 20
1-b.	own.	motor	1350	14	B&B.	grv.	cone.	own.	selec.		amid.	4	worm	own.	10.00	r-rd.	t-arm	Sp-P.	ext-d-s.	int-r-w.	l.	Ross.	r.	mtl	own.	Riker B
1-b.	own.	motor	1350	14	B&B.	grv.	cone.	own.	selec.		amid.	4	worm	own.	10.00	r-rd.	t-arm	Sp-P.	ext-d-s.	int-r-w.	l.	Ross.	r.	mtl	own.	Riker BB
none.			2200	50	Rayfld.	vac.	d-p.	B-Beck.	selec.	G-Lees.	mtr.	3	bevel.	Col.	4.45	sprgs.	t-arm.	Tuth.	int-r-w.	ext-r-w.	l.	Gem	ctr.	mtl	Spicer.	Rock Falls 14
cent.	Simp.	motor	1500	24	Zenith.	grv.	d-d.	B-Lipe	selec.	B-Lipe.	mtr.	4	worm	Shel.	6.50	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe CW
cent.	Simp.	motor	1500	20	Zenith.	grv.	d-d.	B-Liz.	selec.	B-Lipe.	mtr.	4	worm	Shel.	7.75	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe CDW
cent.	Simp.	motor	1400	19	Zenith.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Shel.	7.75	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe GSW
none.	Simp.		2000	32	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Shel.	7.75	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe GPW
cent.	Simp.	motor	1400	17	Zenith.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Shel.	8.75	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe HW
cent.	Simp.	motor	1300	17	Zenith.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Shel.	8.75	r-rd.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer*	Rowe FW
cent.	Pierce.	motor	1100	15	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.	7.80	sprgs.	sprgs.	Mth.	int-r-w.	int-r-w.	l.	Gem.	l.	mtl	Blood.	Rumely A
none.			1400	18	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.	7.87	sprgs.	sprgs.	GCS.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Sandow G
none.			1300	16	Stmbg.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.		sprgs.	sprgs.	GCS.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Sandow CG
suct.	Mnrch.	motor	1100	15	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Timkn	9.25	sprgs.	sprgs.	GCS.	int-r-w.	int-r-w.	r.	Ross.	ctr.	mtl	Spicer*	Sandow J
suct.	Mnrch.	motor	1100	15	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn		r-rd.	sprgs.	GCS.	int-r-w.	int-r-w.	r.	Ross.	ctr.	mtl	Spicer*	Sandow M
suct.	Mnrch.	motor	1250	12	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	11.66	r-rd.	sprgs.	GCS.	int-r-w.	int-r-w.	r.	Ross.	ctr.	mtl	Spicer*	Sandow L
cent.	Pierce.	motor	1260	16	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Shel.	8.70	sprgs.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&Fl.	Sanford W25
cent.	Pierce.	motor	1150	14	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Shel.	8.70	sprgs.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&Fl.	Sanford W35
cent.	Cont.	motor	1000	11	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Shel.	10.25	sprgs.	sprgs.	Shel.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&Fl.	Sanford W50
cent.	Dplx.	motor	900		Schblr.	grv.	cone.	own.	selec.	own.	amid.	3	worm	own.	9.66	r-rd.	t-arm.	Nat.	ext-d-s.	int-r-w.	l.	own.	ctr.	mtl	M&E.	Schacht
cent.	Dplx.	motor	900		Schblr.	grv.	cone.	own.	selec.	own.	amid.	3	worm	own.	10.33	r-rd.	t-arm.	Nat.	ext-d-s.	int-r-w.	l.	own.	ctr.	mtl	M&E.	Schacht
cent.	Dplx.	motor	900		Schblr.	grv.	cone.	own.	selec.	own.	amid.	4	worm	own.	10.33	r-rd.	t-arm.	Nat.	ext-d-s.	int-r-w.	l.	own.	ctr.	mtl	M&E.	Schacht
cent.	Dplx.	motor	900		Schblr.	grv.	cone.	own.	selec.	own.	amid.	8	worm	own.	14.33	r-rd.	t-arm.	Nat.	ext-d-s.	int-r-w.	l.	own.	ctr.	mtl	M&E.	Schacht
cent.	Pierce.	motor	1235	18	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Timkn	7.00	sprgs.	sprgs.	S-P.	int-r-w.	int-r-w.	r.	Lavn.	Ctr.	mtl	Spicer.	Selden 1½A
cent.	Pierce.	motor	1200	16	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	7.75	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	r.	Gem.	r&c.	mtl	Spicer.	Selden 2½A
cent.	Pierce.	motor	1125	14	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	8.75	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	r.	Gem.	r&c.	mtl	Spicer.	Selden 3½A
cent.	Cont.	motor	1135	13	Stmbg.	grv.	d-d.	Detlaf.	selec.	B-Lipe.	amid.	4	worm	Timkn	10.30	r-rd.	sprgs.	Sp-P.	int-r-w.	int-r-w.	l.	Gem.	l&c.	mtl	Spicer.	Selden 5A
none.			2200	42	Schblr.	vac.	d-p.	B-Beck.	selec.	Warren.	mtr.	3	bevel.	Peru.	4.75	sprgs.	t-arm.	Math.	ext-r-w.	int-r-w.	l.	Ditw.	ctr.	mtl	Unvsl.	Seneca M20
none.			1700	18	Stmbg.	vac.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Timkn	7.75	sprgs.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Arvac.	Service 22O
none.			1400	15	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	7.75	sprgs.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 31
none.			1400	15	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	7.00	sprgs.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 36
none.			1400	15	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	7.75	sprgs.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 51
none.			1400	13	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	8.75	r-rd.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 71
none.			1250	14	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	7.80	r-rd.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 76
none.			1250	11	Stmbg.	grv.	d-p.	B-Beck.	selec.	B-Lipe.	amid.	4	worm	Timkn	10.25	r-rd.	sprgs.	opt.	int-r-w.	int-r-w.	l.	Ross.	ctr.	f-m	Sp&o.	Service 101
none.			1600	30	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	bevel.	Eaton.	5.62	sprgs.	sprgs.		int-r-w.	int-r-w.	l.	own.	ctr.	fab	own.	Service 15
cent.	Pierce.	motor	1400	20	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	3	worm	Timkn	9.25	r-rd.	sprgs.	Dtr.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Unvsl.	Signal NF
cent.	Pierce.	motor	1100	15	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	9.25	r-rd.	sprgs.	Dtr.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Unvsl.	Signal H
cent.	Pierce.	motor	1100	15	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	9.25	r-rd.	sprgs.	Dtr.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Signal J
cent.	Pierce.	motor	1200	12	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	12.00	r-rd.	sprgs.	Dtr.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Signal M
cent.	Cont.	motor	1200	12	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	11.66	r-rd.	sprgs.	Dtr.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Signal R
cent.	Pierce.	motor	1400	20	Zenith.	vac.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Fred.	7.75	sprgs.	sprgs.	Shel.	ext-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	BCA.	Southern 10
cent.	Pierce.	motor	1400	18		vac.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.	8.25	sprgs.	sprgs.	Shel.	ext-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	BCA.	Southern 15
cent.	Pierce.	motor	1400	15	Zenith.	vac.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.	9.00	sprgs.	sprgs.	Shel.	ext-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	BCA.	Southern 20
suct.	Mnrch.	motor	1200	17	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Timkn	7.20	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Standard 1K
suct.	Mnrch.	motor	1200	15	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	8.50	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Standard 7K
suct.	Mnrch.	motor	1000	12	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	10.33	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Gem.	ctr.	mtl	Spicer.	Standard 6K
suct.	Mnrch.	motor	1300	10	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	13.66	r-rd.	sprgs.	S-P.	int-r-w.	int-r-w.	l.	Gem.	ctr.	mtl	Spicer.	Standard 5K
cent.	Wau.	motor	1000	18	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Timkn	7.00	r-rd.	sprgs.	Math.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Sterling
cent.	Wau.	motor	1000	16	Zenith.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Timkn	7.70	r-rd.	sprgs.	Math.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Spicer.	Sterling
cent.	Wau.	motor	1000	15	Zenith.	vac.	w-d.	H-S.	ind-c.	own.	amid.	3	worm	Timkn	8.75	r-rd.	sprgs.	Math.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Unvsl*	Sterling
cent.	Wau.	motor	1000	15	Zenith.	vac.	w-d.	H-S.	ind-c.	own.	amid.	3	worm	Timkn	8.80	r-rd.	sprgs.	Math.	int-r-w.	int-r-w.	l.	Ross.	ctr.	mtl	Unvsl*	Sterling
cent.	Wau.	motor	1000	18	Zenith.	vac.	w-d.	H-S.	ind-c.	own.	amid.	6		own.	7.40	r-rd.		Math.	int-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Unvsl.	Sterling
cent.	Wau.	motor	1000	16	Zenith.	vac.	w-d.	H-S.	ind-c.	own.	amid.	6	chn.	own.	7.26	r-rd.		Math.	int-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Unvsl.	Sterling
none.			1400	22	Zenith.	grv.	d-p.	B-Beck.	selec.	Dur.	mtr.	3	int-g.	Clrk.	6.60	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	CAS.	ctr.	mtl	Hart.	Stewart 11
none.			1200	30	Zenith.	grv.	d-p.	B-Beck.	selec.	Dur.	mtr.	3	int-g.	Clrk.	6.75	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 12
			1250	18	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	int-g.	Clrk.	7.60	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 9
cent.	Pierce.	motor	1100	14	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	int-g.	Clrk.	9.00	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 7
cent.	Pierce.	motor	1200	14	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	int-g.	Clrk.	9.00	sprgs.	sprgs.		ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 7x
cent.	Pierce.	motor	1120	12	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	int-g.	Clrk.	10.00	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 10
cent.	Pierce.	motor	1100	12	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	int-g.	Clrk.	10.00	sprgs.	sprgs.	Drt.	ext-r-w	ext-d-s.	l.	Ross.	ctr.	mtl	Hart.	Stewart 10x
cent.	Wau.	motor	1300	30	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Shel.	5.00	r-rd.	sprgs.	Shel.	int-r-w	int-r-w	l.	Lavn.	ctr.	fab	Therm.	Stoughton A
cent.	Wau.	motor	1230	17	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Shel.	7.80	r-rd.	sprgs.	Shel.	int-r-w	int-r-w	l.	Lavn.	ctr.	fab	Snead*	Stoughton B
cent.	Dplx.	motor	1230	17	Stmbg.	grv.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	4	worm	Shel.	8.66	r-rd.	sprgs.	Shel.	int-r-w	int-r-w	l.	Lavn.	ctr.	fab	Snead*	Stoughton D
			1200	16	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	mtr.	3	worm	Timkn	7.75	sprgs.	sprgs.	Shel.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Spicer.	Sullivan E
cent.	Pierce.	motor	1350	14	Stmbg.	vac.	d-d.	B-Lipe.	selec.	B-Lipe.	amid.	4	worm	Timkn	10.33	r-rd.	sprgs.	Shel.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Spicer.	Sullivan H
cent.	Simp.	motor	1100	13½	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	worm	Shel.	8.75	sprgs.	sprgs.	Shel.	int-r-w	int-r-w	l.	Lavn.	ctr.	fab	Therm.	Super-Truck 50
cent.	Simp.	motor	1100	11	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	amid.	4	worm	Shel.	10.25	sprgs.	sprgs.	Shel.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Spicer.	Super-Truck 70
cent.	Simp.	motor	1000	11	Zenith.	grv.	d-d.	Fuller.	selec.	Fuller.	amid.	4	worm	Shel.	10.25	r-rd.	sprgs.	Shel.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Spicer.	Super-Truck 100
none.			1200	30	Cart.	vac.	d-p.	B-Beck.	selec.	G-Lees.	mtr.	3	bevel.		15.46	sprgs.	t-arm.	Shel.	ext-r-w	int-r-w	l.	CAS.	ctr.	mtl	Unvsl.	Texas 1921
cent.	Pierce.	motor	1100	14	Schblr.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	3	worm	Shel.	7.75	r-rd.	sprgs.	GCS.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Peters.	Tiffin F15
cent.	Pierce.	motor	1100	13	Schblr.	grv.	d-d.	Fuller.	selec.	Fuller.	mtr.	4	worm	Shel.	8.70	r-rd.	sprgs.	GCS.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Peters.	Tiffin F23
cent.	Pierce.	motor	1000	13	Schblr.	grv.	d-d.	Detlaf.	ind-c.	Cotta.	amid.	4	worm	Shel.	8.75	r-rd.	sprgs.	GCS.	int-r-w	int-r-w	l.	Ross.	ctr.	mtl	Peters.	Tiffin F55

For abbreviations see page 336.

Specifications of Gas

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME: Make	FRAME: Material	FRAME: Type	TIRES: Kind	TIRES: Size in Ins. Front	TIRES: Size in Ins. Rear	WHEELS: Make	WHEELS: Type	ENGINE: Make	ENGINE: No. Cyl. Bore and Stroke—N.A.C.C. Hp.	ENGINE: Cylinders Cast	COOLING: Water Circ.	COOLING: RADIATOR CASE Make	COOLING: RADIATOR CASE Type	COOLING: RADIATOR CORE Make	COOLING: RADIATOR CORE Type	IGNITION: Type	IGNITION: Make	IGNITION: Spark Advance	ELEC. SYSTEM: Type	ELEC. SYSTEM: Make	ELEC. SYSTEM: Extra Cost $
Tiffin F50	5	168	own..	rol-i..	rigid..	sol..	36x6	40x6d	Sth..	mt..	Cont..	4-4½x6 -36.1	2	cent..	own..	cst..	B&O..	fin..	sing..	Bosch*	hand..	s&l-2..	West..	175
Tiffin F60	6	168	own..	rol-i..	rigid..	sol..	36x6	40x12	Sth..	mt..	Cont..	4-4½x6 -36.1	2	cent..	own..	cst..	B&O..	fin..	sing..	Bosch*	hand..	s&l-2..	West..	175
Titan Ts	2½	156	Smh..	p-stl..	flex..	sol*..	34x4	36x4d	Bim..	wd..	Buda..	4-4½x5½-29.0	4	cent..	own..	cst-a..	McC..	fin..	sing..	Eismn.	hand..	lghtg..	West..	non5
Titan Ht	3½	156	Smh..	p-stl..	flex..	sol*..	34x4	36x6d	Day..	mt..	Buda..	4-4½x6 -32.4	4	cent..	own..	cst-a..	own..	fin..	sing..	Eismn.	hand..	lghtg..	West..	none
Titan Hd	6	156	Smh..	p-stl..	flex..	sol..	36x5	40x6d	Clrk..	mt..	Buda..	4-4½x6 -32.4	4	cent..	own..	cst-a..	McC..	fin..	sing..	Eismn.	hand..	lghtg..	West..	none
Tower J	1½	142	Elyr..	p-stl..	s-flex..	pnu..	35x5	38x7	Roy..	wd..	Cont..	4-4½-5½-27.2	4	cent..	own..	cst..	Brem.	fin..	sing..	Eismn.	hand..	none.	.....	....
Tower H	2½	146	Drt..	p-stl..	s-flex..	sol..	36x4	36x7	Prud..	wd..	Cont..	4-4½x5½-27.2	4	cent..	own..	cst..	Brem.	fin..	sing..	Eismn.	hand..	none.	.....	....
Tower G	3½	165	Drt..	p-stl..	s-flex..	sol..	36x5	36x5d	Sth..	mt..	Cont..	4-4½x5½-32.4	2	cent..	own..	cst..	Brem.	fin..	sing..	Eismn.	hand..	none.	.....	....
Traffic C	2	132	own..	rol-c..	s-flex..	sol..	34x4	34x5	Bim..	wd..	Cont..	4-3½x5 -22.5	4	ther..	own..	cst..	own..	cel..	sing..	Bosch.	hand..	none.	.....	....
Transport 20	1	130	Drt..	p-stl..	flex..	sol..	34x3½	34x4	MWC.	wd..	Buda.	4-3½x5½-22.5	4	ther..	own..	cst..	Mod..	cel..	sing..	Eismn.	hand..	l&i..	.....	125
Transport 30	1½	140	Drt..	p-stl..	flex..	sol..	36x3½	36x5	MWC.	wd..	Cont..	4-3½x5 -22.5	4	ther..	own..	cst..	Mod..	cel..	sing..	Eismn.	hand..	l&i..	.....	125
Transport 50	2½	150	Drt..	p-stl..	flex..	sol..	36x4	36x3	MWC.	wd..	Buda.	4-4½x5½-29.0	4	cent..	own..	cst..	Mod..	cel..	sing..	Eismn.	hand..	l&i..	.....	125
Transport 70	3½	170	.....	p-stl..	.....	sol..	36x5	36x10	Clrk..	mt..	Buda.	4-4½x6 -32.4	4	cent..	.....	.....	Mod..	cel..	sing..	Eismn.	hand..	.....	.....	....
Triangle AA	¼	115	Mas..	rol-c..	s-flex..	pnu..	35x5	35x5	Roy..	wd..	H-S..	4-3½x5 -16.9	4	ther..	Pfx..	pst..	Pfx..	zz-t..	sing..	N-E..	hand..	s&i..	N-E..	....
Triangle A	1½	144	Mas..	rol-c..	s-flex..	sol*..	34x3½	34x6	Roy..	wd..	Wau..	4-3½-5½-22.5	4	cent..	Pfx..	prs..	Pfx..	zz-t..	sing..	Eismn.	hand..	s&l-2..	N-E..	125
Triangle B	2½	150	Mas..	rol-c..	s-flex..	sol*..	36x4	36x7	Roy*.	wd*..	Wau..	4-4 x5½-25.6	2	cent..	Pfx..	prs..	Pfx..	zz-t..	sing..	Eismn.	hand..	lghtg..	.....	100
Triangle C	2	147	Mas..	rol-c..	s-flex..	sol*..	36x4	36x6	Roy..	wd..	Wau..	4-3½x5½-22.5	4	cent..	Pfx..	prs..	Pfx..	zz-t..	sing..	Eismn.	hand..	s&l..	N-E..	125
Twin City BW	2	150	own..	rol-c..	rigid..	sol*..	36x4	36x7	Bim..	wd..	Buda.	4-4 x5½-25.6	4	cent..	own..	cst..	Mod..	cel..	sing..	Bosch.	hand..	s&l-2..	.....	....
Twin City AW	3½	168	own..	rol-c..	rigid..	sol..	36x5	40x5d	Sth..	mt..	own..	4-4½x6 -29.0	4	cent..	own..	cst..	Mod..	cel..	sing..	Bosch.	hand..	s&l-2..	.....	....
Ultimate A	2	156	P&B..	p-stl..	flex..	sol*..	36x3½*	36x5*	Jns..	wd..	Buda.	4-4 x5½-25.6	4	cent..	own..	cst..	Bush..	fin..	sing..	Eismn.	hand..	.....	.....	....
Ultimate AJ	2	156	P&B..	p-stl..	flex..	pnu..	35x5	38x7	Jns..	wd..	Buda.	4-4½x5½-29.0	4	cent..	own..	cst..	Bush..	fin..	sing..	Eismn.	hand..	s&l..	West..	....
Ultimate B&BL	3	154	P&B..	p-stl..	flex..	sol*..	36x4*	36x4d*	Jns..	wd..	Buda.	4-4½x5½-29.0	4	cent..	own..	cst..	Bush..	fin..	sing..	Eismn.	hand..	.....	.....	....
Union F	2½	155	own..	p-stl..	s-flex..	sol*..	36x5	36x8	Prud..	wd..	Wsc..	4-4 x6 -29.0	4	cent..	own..	cst-a..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	L-N..	300
Union H	4	174	own..	p-stl..	s-flex..	sol..	36x6	36x10	Sth..	mt..	Wsc..	4-4½x6 -32.4	4	cent..	own..	cst-a..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	L-N..	300
Union J	6	193	own..	p-stl..	rigid..	sol..	36x6	40x14	Sth..	mt..	Wsc..	4-5 x6 -40.0	2	cent..	own..	cst-a..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	L-N..	300
United A	1½	145	own..	p-stl..	s-flex..	sol*..	34x3½	34x5	Prud..	wd..	Buda..	4-3½x5½-22.5	4	cent..	own..	cst..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	West..	185
United B	2½	151	own..	p-stl..	s-flex..	sol*..	36x4	36x7	Prud..	wd..	Buda.	4-4½x5½-29.0	4	cent..	own..	cst..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	West..	185
United C	3½	157	own..	p-stl..	s-flex..	sol..	36x5	36x5d	Clrk..	mt..	Buda.	4-4½x5½-29.0	4	cent..	own..	cst..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	West..	185
United V	5	160	own..	p-stl..	s-flex..	sol..	36x5	40x6d	Clrk..	mt..	Buda.	4-4½x6 -32.4	4	cent..	own..	cst..	G&O..	fin..	sing..	Eismn.	hand..	s&l-2..	West..	185
U.S N	1½	144	own..	p-stl..	s-flex..	sol*..	36x3½	36x5	Sch..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Lng..	cst..	Lng..	fin..	sing..	Eismn.	hand..	s&i-2..	Eismn.	....
U.S R	3	156	own..	p-stl..	s-flex..	sol..	36x4	36x4d	Sch..	wd..	Hink..	4-4 x5½-25.6	4	cent..	Lng..	cst..	Long..	fin..	sing..	Eismn.	hand..	s&i-2..	Eismn.	....
U.S S	4	168	own..	p-stl..	s-flex..	sol*..	36x5	36x5d	Sch..	wd..	Hink..	4-4½x5½-32.4	4	cent..	Lng..	cst..	Long..	fin..	sing..	Eismn.	hand..	s&i-2..	G&D..	....
U.S T	6	172	own..	p-stl..	s-flex..	sol..	36x6	40x6d	Sth..	mt..	Buda..	4-4½x6½-36.1	4	cent..	Lng..	cst..	Long..	fin..	sing..	Eismn.	hand..	s&i-2.	Opt..	....
U.S. NC	2	144	own..	p-stl..	s-flex..	pnu..	35x5	38x7	Sch..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Lng..	cst..	Lng..	fin..	sing..	Eismn.	hand..	s&i-2.	Eismn.	....
U.S. NW	1½	144	own..	p-stl..	s-flex..	solid..	36x3½	36x5	Sch..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Lng..	cst..	Lng..	fin..	sing..	Eismn.	hand..	s&i-2.	Eismn.	....
U.S. NP	2	144	own..	p-stl..	s-flex..	pnu..	35x5	38x7	Sch..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Lng..	cst..	Lng..	fin..	sing..	Eismn.	hand..	s&i-2.	Eismn.	....
Velie 46	1½	133	Dun..	p-stl..	s-flex..	sol..	36x3½	36x5	Bim..	wd..	Cont..	4-3½x5 -22.5	4	cent..	own..	cst..	McC..	fin..	sing..	Berlg..	hand..	none.	.....	....
Victor	1½	138	own..	rol-c..	.....	pnu*.	37x5	36x6	opt..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Mod..	cst..	Mod..	zz-t..	sing..	Eismn.	hand..	lghtg..	.....	100
Vim 29	½	108	.....	p-stl..	flex..	pnu..	31x4	31x4	.....	wd..	.....	4-3½x4½-15.6	4	ther..	.....	sht..	.....	fin..	sing..	West..	hand..	s&i-2.	West..	none
Vim 31	1	125	.....	p-stl..	flex..	pnu..	35x5	35x5	.....	wd..	.....	4-3½x5½-22.5	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	s&i-2.	West..	none
Vim 22	2	142	.....	p-stl..	flex..	sol..	36x4	36x6	.....	mt..	.....	4-3½x5½-22.5	4	g-p..	.....	cst..	.....	fin..	sing..	.....	hand..	.....	.....	....
Vim 23	3	175	.....	p-stl..	flex..	sol..	36x5	36x5d	.....	mt..	.....	4-4½x5½-29.0	4	g-p..	.....	cst..	.....	fin..	sing..	.....	hand..	.....	.....	....
Vulcan 25	2½	148	own..	p-stl..	s-flex..	sol..	36x4	36x8	Sth..	mt..	Wsc..	4-4½x6 -29.0	4	cent..	own..	cst..	Lng..	fin..	sing..	Eismn.	hand..	lghtg..	Eismn.	....
Vulcan 25P	3	160	own..	p-stl..	s-flex..	sol..	36x6	40x8	Sth..	mt..	Wsc..	4-4½x6 -29.0	4	cent..	own..	cst..	Lng..	fin..	sing..	Eismn.	hand..	lghtg..	Eismn.	....
W. J. B	2½	150	Hyd..	p-stl..	rigid..	sol*..	36x4	36x8	Arch..	wd..	Buda..	4-4½x5½-29.0	4	cent..	Bush..	cst..	Bush..	fin..	sing..	Eismn.	hand..	lghtg..	Eismn.	150
Waltham E	1½	140	Cas..	p-stl..	.....	pnu..	36x6	38x7	.....	wd..	Buda..	4-3½x5½-22.5	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Apollo	hand..	lghtg..	Bijur..	....
Ware A	5	135	.....	p-stl..	.....	pnu*.	.....	.....	.....	wd..	own..	8-3½x5 -37.0	4	cent..	.....	pst..	.....	p-t..	sing..	.....	hand..	s&i..	.....	....
Walter S	5	168	Shar..	p-stl..	flex..	sol..	36x5	40x6d	Day..	mt..	Wau..	4-4½x6½-32.4	4	cent..	Bush.	cst..	Bush..	fin..	sing..	Sim..	hand..	s&l..	West..	....
Ward-LaFrance 2B	2½	170*	own..	p-stl..	flex..	sol..*	36x4	36x7	H&D*	wd..*	Wau.	4-4½x5½-30.6	2	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	lghtg.	West..	125
Ward-LaFrance 4A	3½	162*	own..	p-stl..	flex..	sol..*	36x5	36x5d	Sth..	mt..	Wau.	4-4½x6½-32.5	2	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	lghtg.	West..	125
Ward-LaFrance 5A	5	164*	own..	p-stl..	flex..	sol..	36x6	36x6d	Sth..	mt..	Wau.	4-5 x6½-40.0	2	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	lghtg.	West.	125
Watson B	1	128	Prsh..	p-stl..	s-flex..	pnu..	34x4½	34x4½	H&D.	wd..	Wau.	4-3½x5½-22.5	4	cent..	G&O..	pst..	G&O.	cel..	sing..	Conn..	hand..	s&i-2.	Dneto.	none
Watson N	3½	168	Prsh..	p-stl..	rigid..	sol..	36x5	36x10	Crn..	wd..	Cont..	4-4½x5½-32.4	2	cent..	own..	cst..	R-T..	fin..	sing..	Sim..	hand..	none.	.....	....
Western W1½	1½	144	own..	rol-c..	s-flex..	opt..	36x3½	36x5	Prud..	wd..	Cont..	4-4½x5½-27.2	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Bosch.	hand..	lghtg..	Vesta.	150
Western L1½	1½	144	Savg..	p-stl..	s-flex..	opt..	36x3½	36x5	Prud..	wd..	Buda.	4-3½x5 -22.5	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Bosch.	hand..	lghtg..	Vesta.	150
Western W2½	2½	154	own..	rol-c..	s-flex..	sol..	36x4	36x7	Prud..	wd..	Cont..	4-4½x5½-27.2	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Bosch.	hand..	lghtg..	Vesta..	150
Western L2½	2½	154	Savg..	p-stl..	s-flex..	sol..	36x4	36x7	Prud..	wd..	Buda.	4-4½x6 -29.0	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Bosch.	hand..	lghtg..	Vesta.	150
Western W3½	3½	164	own..	rol-c..	s-flex..	sol..	36x5	40x5d	Prud..	wd..	Buda.	4-4½x6 -32.4	4	cent..	Chgo..	cst..	Chgo.	fin..	sing..	Bosch.	hand..	lghtg..	Vesta.	150
White 15	¼	133½	own..	p-stl..	.....	pnu..	34x5	34x5	.....	wd..	own..	4-3½x5½-22.5	4	cent..	.....	sht-b..	.....	cel..	dual..	.....	auto.	.....	.....	....
White 20	2	157½	own..	p-stl..	.....	sol*..	36x4	36x4d	.....	mt..	own..	4-3½x5½-22.5	4	cent..	.....	sht-b..	.....	cel..	dual..	.....	auto.	.....	.....	....
White 40	3–3½	174	.....	rol-i..	.....	sol..	36x5	40x5d	.....	mt..	own..	4-3½x5½-22.5	4	cent..	.....	.....	.....	fin..	dual..	.....	auto.	.....	.....	....
White 45	5	174	.....	rol-i..	.....	sol..	36x6	40x6d	.....	mt..	own..	4-4½x5½-29.0	4	cent..	.....	.....	.....	fin..	dual..	.....	auto.	.....	.....	....
White Hickory E	1	124	P&B..	p-stl..	s-flex..	pnu..	34x5	34x5	Bim..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Chgo..	cst..	Chgo.	fin..	sing..	Eismn.	fixed.	lghtg..	Vesta.	....
White Hickory H	1½	144	P&B..	p-stl..	s-flex..	sol..	36x3½	36x5	Bim..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Eismn.	fixed.	lghtg..	Vesta.	....
White Hickory K	2½	150	P&B..	p-stl..	s-flex..	sol..	36x4	36x7	Bim..	wd..	Cont..	4-4½x5½-27.2	4	cent..	Chgo..	cst..	Chgo..	fin..	sing..	Eismn.	fixed.	lghtg..	Vesta.	....
White Hickory M	3½	156	Shar..	p-stl..	s-flex..	sol..	36x5	36x5d	Sth..	mt..	Cont..	4-4½x5½-32.4	2	cent..	Chgo.	cst..	Chgo.	fin..	sing..	Eismn.	fixed.	lghtg..	Vesta.	....
Wichita K	1	144	own..	p-stl..	s-flex..	sol*..	36x3	36x4	.....	wd..	own..	4-3½x5 -19.6	4	ther..	.....	cst..	.....	cel..	sing..	.....	hand..	none.	.....	....
Wichita L	1½	144	own..	p-stl..	s-flex..	sol*..	36x3½	36x5	.....	wd..	.....	4-3½x5½-22.5	4	cent..	.....	cst..	.....	cel..	sing..	.....	hand..	none.	.....	....
Wichita M	2	144	own..	p-stl..	.....	sol*..	36x3½	36x6	.....	wd..	.....	4-3½x5½-22.5	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	none.	.....	....
Wichita R	2½	144	own..	p-stl..	s-flex..	sol*..	36x4	36x7	.....	mt..	.....	4-3½x5½-22.5	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	none.	.....	....
Wichita Rx	2½	160	own..	p-stl..	.....	sol*..	36x4	36x8	.....	mt..	.....	4-4½x6 -29.0	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	none.	.....	....
Wichita O	3½	165	own..	p-stl..	s-flex..	sol*..	36x5	36x5	.....	mt..	.....	4-4½x6 -29.0	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	none.	.....	....
Wichita S	5	165	own..	p-stl..	s-flex..	sol..	36x6	40x6d	.....	mt..	.....	4-4½x6 -32.4	4	cent..	.....	cst..	.....	fin..	sing..	.....	hand..	none.	.....	....
Wilcox AA	1	130	Smh..	p-stl..	flex..	sol*..	36x4	36x4	Crn..	wd...	Buda..	4-3½x5½-22.5	4	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	lghtg.	West..	none
Wilcox B	1½	144	Smh..	p-stl..	flex..	sol*..	36x4	36x5	Sth..	mt..	own..	4-4½x5 -29.0	2	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	none.	.....	....
Wilcox D	2½	150	Smh..	p-stl..	flex..	sol*..	36x4	36x3½	Crn..	mt..	own..	4-4½x5 -29.0	2	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	none.	.....	....
Wilcox E	3½	162	Smh..	p-stl..	flex..	sol*..	36x5	36x5d	Sth..	mt..	Buda.	4-4½x6 -32.4	4	cent..	own..	cst..	Lng..	fin..	sing..	Bosch.	hand..	none.	.....	....
Wilcox F	5	162	Smh..	p-stl..	flex..	sol..	36x5	40x6d	Sth..	mt..	Buda.	4-4½x6½-36.1	4	cent..	own..	cst..	Lng..	fin..	sing..	.....	hand..	none.	.....	....
Winther 751	¾–1	135	own..	rol-c..	s-flex..	pnu..	34x4½	35x5	Auto..	wd..	H-S..	4-3½x5 -19.6	4	ther..	own..	cst..	Brem.	pln..	sing..	West..	hand..	s&l-2..	West..	none
Winther 39	1½	140	own..	rol-c..	s-flex..	sol..	34x3½	34x5	own..	mt..	Wsc..	4-3½x5 -22.5	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	100
Winther 49	2	147	own..	rol-c..	s-flex..	sol..	34x4	34x4d	own..	mt..	Wsc..	4-4 x5 -25.6	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	155
Winther 70	3½	150	own..	rol-c..	s-flex..	sol..	36x5	36x5d	Clrk..	mt..	Wsc..	4-4 x6 -25.6	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	150
Winther 109	5	162	own..	rol-c..	s-flex..	sol..	36x6	40x5d	Clrk..	mt..	Wsc..	4-4½x6 -32.4	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	180
Winther 140	7	162	own..	rol-c..	s-flex..	sol..	36x6	40x7	Clrk..	mt..	Wsc..	4-5 x6 -40.0	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	180
Winther 430	1½	132	own..	rol-c..	s-flex..	sol..	32x4	32x4	own..	mt..	Wsc..	4-3½x5 -22.5	4	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	180
Winther 450	2½	150	own..	rol-c..	s-flex..	sol..	34x5	36x6	own..	mt..	Wsc..	4-4 x5 -25.6	2	cent..	own..	cst..	Brem.	pln..	sing..	Eismn.	hand..	s&l-2..	West..	150
Witt-Will N	1½	122	Prsh..	p-stl..	s-flex..	sol*..	36x3½	36x5	Arch..	wd..	Cont..	4-3½x5 -22.5	4	cent..	Brem.	cst..	Brem.	fin..	sing..	Eismn.	auto.	none.	.....	....
Witt-Will P	2½	144	Prsh..	p-stl..	s-flex..	sol*..	36x3½	36x7	Arch..	wd..	Cont..	4-4½x5½-27.2	4	cent..	Brem.	cst..	Brem.	fin..	sing..	Eismn.	auto.	none.	.....	....
Yellow Cab M2	½	116½	.....	p-stl..	.....	pnu..	33x4½	33x4½	.....	wd..	Cont..	4-3½x5 -22.5	4	ther..	.....	.....	.....	.....	sing..	Bosch.	fixed.	lghtg..	.....	....
Yellow Cab M4	1	130	.....	p-stl..	.....	pnu..	35x5	35x5	.....	wd..	Cont..	4-3½x5 -22.5	4	ther..	.....	.....	.....	.....	sing..	Bosch.	.....	none.	.....	....

For abbreviations see page 336.

SIDE GUIDE & GRIPPER

oline Trucks—*Continued*

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		Name and Model
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE								STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By	Springs Make	Foot	Hand	Placed	Make	Levers	Type	Make	
suct..	Cont..	motor.	1000	11	Schblr..	grv..	d-d...	Detlaf..	ind-c..	Cotta..	amid..	4	worm.	Shel..	10.25	r-rd..	sprgs..	GCS.	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Peters..	Tiffin.....F50
suct..	Cont..	motor.	1000	11	Schblr..	grv..	d-d...	Detlaf..	ind-c..	Cotta..	amid..	4	worm.	Shel..	10.25	r-rd..	sprgs..	GCS.	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Peters..	Tiffin.....F60
cent..	Simp...	motor.	1150	25	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	4	int-g.	Clrk..	.....	r-rd..	sprgs..	Math.	int-r-w.	ext-d-s.	l...	Wol...	ctr..	mtl	M&E..	Titan.....TS
cent..	Simp...	motor.	1050	15	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	mtr...	4	int-g.	Day..	.....	r-rd..	sprgs..	Math.	int-r-w.	ext-d-s.	l...	Lavn..	ctr..	mtl	M&E..	Titan.....HI
cent..	Simp...	motor.	1000	12	Stmbg..	grv..	d-p...	B-Beck.	ind-c..	Cotta..	amid..	4	int-g.	Clrk..	.....	r-rd..	sprgs..	Math.	int-r-w.	ext-d-s.	l...	Lavn..	....	mtl	Unvsl..	Titan.....HD
none..	.....	.....	1602	25	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller .	mtr...	3	worm.	Timkn	7.25	r-rd..	sprgs..	Dtr...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Blood..	Tower.....J
cent..	Pierce..	motor.	1296	15	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	9.25	r-rd..	sprgs..	Dtr...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Blood..	Tower.....H
cent..	Pierce..	motor.	1259	13	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	10.33	r-rd..	sprgs..	Dtr...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Blood..	Tower.....G
.....	.....	.....	2000	25	Cart...	grv..	d-d...	Covert.	selec..	Covert.	mtr...	3	int-g.	Rusel.	7.00	sprgs..	sprgs..	Drt...	ext-r-w.	int-r-w.	l...	own..	ctr..	f-m	Sn&Un.	Traffic.....C
cent..	Simp...	d-s...	1432	20	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	7.25	sprgs..	sprgs..	Drt...	ext-r-w.	int-r-w.	l...	Jacox.	l...	fab	Snead..	Transport.....20
cent..	Simp...	d-s...	1276	18	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	7.60	sprgs..	sprgs..	Drt...	ext-r-w.	int-r-w.	l...	Jacox.	l...	mtl	Hart...	Transport.....30
cent..	Simp...	d-s...	1180	15	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g.	Clrk..	8.15	sprgs..	sprgs..	Drt..	ext-r-w.	int-r-w.	l...	Jacox.	l...	mtl	Hart...	Transport.....50
cent..	Dplx...	.....	1100	12	Stmbg..	grv..	.....	B-Beck.	ind-c..	Cotta..	mtr...	4	int-g.	Clrk..	10.00	.....	.....	.....	ext-r-w.	int-r-w.	l...	Jacox.	ctr..	.....	.....	Transport.....70
none..	.....	.....	.....	.....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	6.00	sprgs.	sprgs.	Dtr..	ext-d-s.	ext-r-w.	l...	Gem..	ctr..	mtl	Unvsl.	Triangle.....AA
cent..	Wau...	motor.	1100	18	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	7.00	sprgs..	sprgs.	Dtr..	ext-d-s.	ext-r-w.	l...	Gem..	ctr..	mtl	Unvsl.	Triangle.....A
cent..	Wau...	motor.	1000	16	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g.	Clrk..	9.00	sprgs..	sprgs..	Dtr..	ext-d-s.	ext-r-w.	l...	Gem..	ctr..	mtl	Unvsl.	Triangle.....B
cent..	Wau...	motor.	1200	16	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	8.00	sprgs..	sprgs..	Dtr..	ext-d-s.	ext-r-w.	l...	Gem..	ctr..	mtl	Unvsl.	Triangle.....C
cent..	Simp...	motor.	1100	14	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	8.00	sprgs..	sprgs..	Math.	ext-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Arvac..	Twin City.....BW
cent..	own...	motor.	1000	11	Schblr..	vac..	d-p...	B-Beck.	selec..	Fuller..	amid..	4	worm.	Timkn	10.33	r-rd..	sprgs..	Math.	int-r-w.	int-r-w.	l...	Ross..	ctr..	m-f	Fl&Sp..	Twin City.....AW
cent..	Pierce..	motor.	1100	20	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel..	6.50	r-rd..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Ultimate.....A
none..	.....	.....	1100	40	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel..	6.50	r-rd..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Ultimate.....AJ
cent..	Pierce..	motor.	1100	16	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	4	worm.	Shel..	7.75	r-rd..	sprgs..	Shel..	ext-r-w.	ext-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Ultimate.....B&BL
cent..	Dplx...	motor.	1100	15	Schblr..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g.	Rusel.	7.80	sprgs..	sprgs..	Math.	ext-r-w.	int-r-w.	l...	Ross..	r&c.	mtl	U.P....	Union.....F
cent..	Dplx..	motor.	1100	12	Schblr..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g.	Torbn.	10.25	sprgs..	sprgs..	Math.	int-r-w.	ext-d-s.	l...	Ross..	r&c.	mtl	U.P....	Union.....H
cent..	Dplx..	motor.	1100	10	Schblr..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g.	Rusel.	10.10	sprgs..	sprgs..	Math.	int-r-w.	ext-d-s.	l...	Ross..	r&c.	mtl	M&E..	Union.....J
cent..	Simp...	motor.	1124	15	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	7.60	sprgs..	sprgs..	.....	ext-r-w.	int-r-w.	l...	Jacox.	r&c.	mtl	Blood..	United.....A
cent..	Simp...	motor.	1059	14	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g.	Clrk..	8.15	sprgs..	sprgs..	.....	ext-r-w.	int-r-w.	l...	Jacox.	ctr..	f-m	Th&Bl.	United.....B
cent..	Simp...	motor.	1120	12	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g.	Clrk..	10.00	sprgs..	sprgs..	.....	ext-r-w.	int-r-w.	l...	Lavn..	ctr..	f-m	Th&Bl.	United.....C
cent..	Simp...	motor.	1155	10	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g.	Clrk..	12.50	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	Ross..	ctr..	f-m	Th&Bl.	United.....V
none..	.....	.....	1400	19	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	int-g.	Clrk..	7.60	sprgs..	sprgs..	Shel..	ext-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Blood..	U.S.....N
cent..	Hink..	motor.	1400	17	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	8.70	sprgs..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	f-m	Bl&Fl..	U.S.....R
cent..	Hink..	motor.	1200	12	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.25	sprgs..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	f-m	Bl&Fl..	U.S.....S
cent..	Simp...	motor.	950	11	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	10.25	sprgs..	sprgs..	Shel..	int-r-w.	ext-d-s.	l...	Lavn..	ctr..	f-m	Bl&Fl..	U.S.....T
none..	.....	.....	1730	25	Stmbg..	vac..	d-d...	B-lipe.	selec..	B-lipe.	mtr...	3	int-g.	Clrk..	7.60	sprgs..	sprgs..	Shel..	ext-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Blood..	U.S.....NC
none..	.....	.....	1400	19	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel..	7.80	sprgs..	sprgs..	Shel..	ext-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Blood..	U.S.....NW
none..	.....	.....	1730	25	Stmbg..	vac..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Shel..	7.80	sprgs..	sprgs..	Shel..	ext-r-w	int-r-w.	l...	Lavn..	ctr..	mtl	Blood..	U.S.....NP
suct..	Mnrch.	motor.	1350	18	Stmbg..	grv..	d-p...	B-Beck.	selec..	Dur....	mtr...	3	int-g.	Torbn.	8.00	sprgs..	sprgs..	Math.	ext-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Arvac..	Velie.....46
none..	.....	.....	.....	.....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Fred..	.....	sprgs..	sprgs..	Tuth..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Acme..	Victor.....
.....	.....	.....	.....	.....	.....	grv..	d-p...	.....	selec..	.....	mtr...	3	worm.	.....	5.50	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	.....	ctr..	mtl	.....	Vim.....29
.....	.....	.....	.....	.....	.....	grv..	d-p...	.....	selec..	.....	mtr...	3	worm.	.....	6.50	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	.....	ctr..	mtl	.....	Vim.....31
cent..	.....	motor.	.....	.....	.....	grv..	d-p...	.....	selec..	.....	mtr...	4	worm.	.....	7.75	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	.....	ctr..	mtl	.....	Vim.....22
cent..	.....	.....	.....	.....	.....	grv..	d-p...	.....	selec..	.....	amid..	4	worm.	.....	7.75	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	.....	ctr..	mtl	.....	Vim.....23
cent..	Pierce..	motor.	1250	15	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	8.75	r-rd..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Vulcan.....25
cent..	Pierce..	motor.	1350	21	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Shel..	7.75	r-rd..	sprgs..	Shel..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Vulcan.....25P
cent..	Pierce..	motor.	1270	16	Zenith..	grv..	d-d...	B-Lipe*	selec..	B-Lipe*	amid..	4	worm.	Timkn	8.50	sprgs..	sprgs..	S-P....	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	W. J.....B
.....	.....	.....	1200	20	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Shel..	7.50	sprgs..	sprgs..	Drt...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Waltham.....E
cent..	Pierce..	motor.	.....	.....	.....	grv..	w-p...	H-S....	ind-c..	.....	u-jst.	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Ware.....A
cent..	Wau..	motor.	1000	15	Stmbg..	grv..	d-d...	B-Lipe.	selec..	Warner.	amid..	4	int-g.	own...	9.00	sprgs.	sprgs.	Perf...	ext-d-s.	ext-r-w.	l...	Ross..	ctr..	f-m	M&E..	Walter.....S
cent..	Wau..	motor.	1100	18	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	6.80	r-rd..	sprgs.	Merl..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	M&E..	Ward-LaFrance.....2B
cent..	Wau..	motor.	1000	14	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	7.80	r-rd..	sprgs.	Merl..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	M&E..	Ward-LaFrance.....4A
cent..	Wau..	motor.	1000	14	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Timkn	8.80	r-rd..	sprgs.	Merl..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	M&E..	Ward-LaFrance.....5A
cent..	Wau..	motor.	1200	25	John...	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Dunk.	6.20	sprgs..	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	M&E..	Watson.....B
cent..	Pierce..	motor.	1100	13	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	amid..	4	worm.	Wis...	9.00	sprgs..	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Gem..	ctr..	mtl	Spicer..	Watson.....N
suct..	Mnrch.	motor.	1087	18	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis...	7.25	sprgs..	sprgs.	GCS.	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Acme..	Western.....W1¼
suct..	Mnrch.	motor.	1087	18	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis...	7.25	sprgs..	sprgs.	GCS.	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Acme..	Western.....L1½
suct..	Mnrch.	motor.	1070	16	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis...	8.25	sprgs..	sprgs.	GCS.	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Acme..	Western.....W2½
suct..	Mnrch.	motor.	1070	16	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Wis...	8.25	sprgs..	sprgs.	GCS.	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Acme..	Western.....L2½
suct..	Mnrch.	motor.	1000	14	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Wis...	10.00	r-rd..	sprgs.	GCS.	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Acme..	Western.....W3½
none..	.....	.....	1400	....	own...	grv..	w-p...	own...	selec..	own...	amid..	4	bevel.	own...	.....	r-rd..	sprgs.	.....	ext-r-w.	int-r-w.	l...	own...	ctr..	mtl	own...	White.....15
none..	.....	.....	1400	....	own...	grv..	w-p...	own...	selec..	own...	amid..	4	d-rd..	own...	.....	r-rd..	sprgs.	.....	ext-r-w.	int-r-w.	l...	own...	ctr..	mtl	own...	White.....20
cent..	own...	motor.	1600	15	own...	va..	w-p...	own...	selec..	own...	mtr...	4	d-rd..	own...	.....	r-rd..	sprgs.	.....	ext-d-s.	int-r-w.	l...	own...	ctr..	mtl	own...	White.....40
cent..	own...	motor.	1600	15	own...	vac..	w-p...	own...	selec..	own...	mtr...	4	d-rd..	own...	.....	r-rd..	sprgs.	.....	ext-d-s.	int-r-w.	l...	own...	ctr..	mtl	own...	White.....45
cent..	Dplx..	motor.	1310	22	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	6.20	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	M&E..	White Hickory.....E
cent..	Dplx..	motor.	1190	15	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	8.50	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Arvac..	White Hickory.....H
cent..	Dplx..	motor.	1110	14	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	8.50	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	M&E..	White Hickory.....K
cent..	Dplx..	motor.	.....	.....	Stmbg..	vac..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Timkn	10.33	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	M&E..	White Hickory.....M
none..	.....	.....	1000	15	.....	grv..	cone..	own...	selec..	.....	amid..	4	worm.	.....	7.80	sprgs.	sprgs.	.....	int....	int....	r...	.....	ctr..	fab	own...	Wichita.....K
cent..	.....	motor.	1000	15	.....	grv..	cone..	own...	selec..	.....	amid..	4	worm.	.....	8.66	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....L
cent..	.....	motor.	1000	13	.....	grv..	cone.	own...	selec..	.....	amid..	4	worm.	.....	8.66	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....M
cent..	.....	motor.	1000	13	.....	grv..	cone.	own...	selec..	.....	amid..	4	worm.	.....	8.75	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....R
cent..	.....	motor.	.....	12	.....	grv..	cone.	.....	selec..	.....	amid..	4	worm.	.....	8.75	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....RX
cent..	.....	motor.	1000	11	.....	grv..	cone.	.....	selec..	.....	amid..	4	worm.	.....	11.75	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....O
cent..	.....	motor.	.....	10	.....	grv..	cone.	.....	selec..	.....	amid..	4	worm.	.....	14.00	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	r...	.....	ctr..	fab	own...	Wichita.....S
cent..	Dplx..	motor.	1500	20	Stmbg..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Wis...	7.75	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l...	Gem..	ctr..	mtl	Spicer..	Wilcox.....AA
cent..	Dplx..	motor.	1100	18	Stmbg..	grv..	cone.	own...	selec..	own...	amid..	4	worm.	Wis...	9.50	sprgs.	sprgs.	Shel..	int-f-w.	int-r-w.	l...	own...	ctr..	mtl	Hart...	Wilcox.....B
cent..	Dplx..	motor.	1100	16	Stmbg..	grv..	cone.	own...	selec..	own...	amid..	4	worm.	Wis...	8.97	sprgs.	sprgs.	Shel..	int-r-w.	int-r-w.	l...	own...	ctr..	mtl	Hart...	Wilcox.....D
cent..	Dplx..	motor.	1000	12	Stmbg..	grv..	cone.	own...	selec..	own...	amid..	4	worm.	Wis...	.....	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l...	own...	ctr..	mtl	Hart...	Wilcox.....E
cent..	Dplx..	motor.	200	10	Stmbg..	grv..	cone.	own...	selec..	own...	amid..	4	worm.	Wis...	.....	r-rd..	sprgs.	Shel..	int-r-w.	int-r-w.	l...	own...	ctr..	mtl	Hart...	Wilcox.....F
none..	.....	.....	2500	40	Stmbg..	vac..	d-d...	.....	.....	Warner.	mtr...	3	int-g.	Torbn.	6.60	sprgs.	sprgs.	Drt...	ext-r-w.	ext-d-s.	l...	Lavn..	ctr..	mtl	Pet....	Winther.....751
none..	.....	.....	1600	23	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	7.00	sprgs.	sprgs.	Drt...	ext-r-w.	ext-d-s.	l...	Lavn..	ctr..	mtl	Pet-Arv	Winther.....39
none..	.....	.....	1500	17	Mast...	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	int-g.	Clrk..	9.00	sprgs.	sprgs.	Mth..	ext-r-w.	int-r-w.	r...	Ross..	ctr..	mtl	Blood..	Winther.....49
none..	.....	.....	1300	16	Mast...	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	int-g.	Clrk..	10.00	sprgs.	sprgs.	Mth..	ext-r-w.	int-r-w.	r...	Ross..	ctr..	mtl	Blood..	Winther.....70
cent..	Dplx..	motor.	1100	12	Mast...	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	int-g.	Clrk..	12.50	sprgs.	sprgs.	Mth..	int-r-w.	int-r-w.	r...	Ross..	ctr..	mtl	Blood..	Winther.....109
cent..	Dplx..	motor.	925	10	Mast...	vac..	d-p...	B-Beck.	selec..	B-Lipe.	amid..	4	int-g.	Clrk.	12.50	sprgs.	sprgs.	Mth..	int-r-w.	int-r-w.	r...	Ross..	ctr..	mtl	Blood..	Winther.....140
none..	.....	.....	1600	17	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk..	9.00	sprgs.	sprgs.	Drt...	ext-r-w.	ext-d-s.	l...	Lavn..	ctr..	mtl	Pet....	Winther.....430
none..	.....	.....	1500	16	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g.	Clrk.	10.40	sprgs.	sprgs.	Drt...	ext-r-w.	ext-d-s.	l...	Lavn..	ctr..	mtl	Pet....	Winther.....450
cent..	Pierce..	motor.	1500	25	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	7.00	sprgs.	sprgs.	Del...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Witt-Will.....N
cent..	Pierce..	motor.	1500	20	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	7.75	sprgs.	sprgs.	Del...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Witt-Will.....P
.....	.....	.....	.....	.....	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	bevel.	Timkn	.....	sprgs.	t-arm.	.....	int-r-w.	ext-r-w.	l...	Gem..	ctr..	mtl	Spicer..	Yellow Cab.....M2
.....	.....	.....	.....	.....	Zenith..	grv..	d-d...	B-Lipe.	selec..	B-Lipe.	mtr...	3	worm.	Timkn	.....	sprgs.	sprgs.	.....	int-r-w.	int-r-w.	l...	Gem..	ctr..	mtl	Spicer..	Yellow Cab.....M4

For abbreviations see page 336.

SIDE GUIDE & GRIPPER

Specifications of Gas

Received Too Late to Classify

Name and Model	Tons Capacity	Wheelbase, Inches	FRAME			TIRES			WHEELS		ENGINE														
							Size in Ins.							COOLING					IGNITION			ELEC. SYSTEM		
															RADIATOR									
															CASE		CORE							
			Make	Material	Type	Kind	Front	Rear	Make	Type	Make	No. Cyl. Bore and Stroke N.A.C.C. Hp.	Cylinders Cast	Water Circ.	Make	Type	Make	Type	Type	Make	Spark Advance	Type	Make	Extra Cost $
Birch	1	132	own..	p-stl..	.....	sol....	32x3½	32x4	.....	wd....	.....	4-3½x5 -19.6	4	ther..	.....	.....	.....	.....	dual..	Conn..	.....	s&l...	Aut-L.	....
Briscoe.....234	1	121	P&B..	prs...	s-flex..	pnu...	33x4	34x4½	Hay..	wd....	own...	4-3⅜x5 -18.2	4	ther..	Pfx...	cst....	Pfx...	zz-t...	dual..	Conn..	hand..	sl&i...	Aut-L.	none
Clark Trucktractor...TB	1¼	78	own...	rol-c..	s-flex..	sol....	25x10	20x7	Clrk..	mt....	LeR..	4-3½x4½-15.6	4	ther...	Fed...	pst....	Fed...	cel....	sing...	Eismn.	t-p....	none.	.....	....
Clark Trucktractor.MAA	1¼	78	own...	rol-c..	s-flex..	sol....	28x3½	20x3½	Clrk..	mt....	LeR..	4-3½x4½-15.6	4	ther...	Fed...	pst....	Fed...	cel....	sing...	Eismn.	t-p....	none.	.....	....
Clark Trucktractor....L	1¼	78	own...	rol-c..	s-flex..	sol....	20x3½	28x3½d	Clrk..	mt....	LeR..	4-3½x4½-15.6	4	ther...	Fed...	pst....	Fed...	cel....	sing...	Eismn.	t-p....	none.	.....	....
Dart.....S	1½	140	Savg..	p-stl..	s-flex..	sol....	34x3½	30x6	Bim...	wd....	Buda..	4-3¾x5½-22.5	4	ther...	own...	cst....	.....	cel....	sing...	Eismn.	hand..	s&l*...	Bijur*.	200
Dart.....M	2½	150	Savg..	p-stl..	s-flex..	sol....	36x4	36x7	Bim...	wd....	Buda..	4-4½x5½-29.0	4	cent...	own...	cst....	.....	cel....	sing...	Eismn.	hand..	s&l*...	Bijur*.	200
Dart.....W	3½	160	Savg..	p-stl..	s-flex..	sol....	36x5	36x10	Bim...	wd....	Buda..	4-4½x6 -32.4	4	cent...	own...	cst....	.....	cel....	sing...	Eismn.	hand..	s&l*...	Bijur*.	200
Denby.....12	1	124	Drt...	p-stl..	.....	pnu...	35x5	36x6	Hay..	wd....	Cont..	4-3¾x5 -22.5	4	ther...	Lng...	fin....	.....	.....	sing...	Eismn.	.....	.....	.....	....
Denby.....33	1½	136	Drt...	p-stl..	.....	pnu...	35x5	38x7	Hay..	wd....	Cont..	4-3¾x5 -22.5	4	ther...	Lng...	.....	.....	.....	sing...	Eismn.	.....	.....	Bijur..	....
Denby.....134	2	144	Drt...	p-stl..	.....	sol....	36x3½	36x6	Hay..	wd....	Cont..	4-3¾x5 -22.5	4	ther...	Lng...	fin....	.....	.....	sing...	Eismn.	.....	.....	.....	....
Denby.....25	3	149½	Drt...	p-stl..	.....	sol....	36x4	36x7	Sth...	mt....	Cont..	4-4½x5½-27.2	4	cent...	Lng...	fin....	.....	.....	sing...	Eismn.	.....	.....	.....	....
Denby.....27	4	170	Drt...	p-stl..	.....	sol....	36x5	36x5d	Sth...	mt....	Cont..	4-4½x5½-32.4	2	cent...	Lng...	fin....	.....	.....	sing...	Eismn.	.....	.....	.....	....
Denby.....210	5	170	Drt...	p-stl..	.....	sol....	36x6	40x6d	Clrk..	mt....	Cont..	4-4½x5½-32.4	2	cent...	Lng...	fin....	.....	.....	sing...	Eismn.	.....	.....	.....	....
Patriot.....Revere	¾	129	.....	p-stl..	.....	pnu...	35x5	35x5	.....	wd....	Cont..	4-3¾x5 -22.5	4	ther...	.....	.....	.....	.....	.....	.....	.....	s&l....	A-Knt	....
Patriot.....Lincoln	1½	140	.....	p-stl..	.....	sol*...	34x3½	34x5	.....	wd....	Hink..	4-4 x5½-25.6	....	cent...	.....	fin....	.....	cst....	sing...	.....	.....	s&l....	.....	....
Patriot.....Washington	2½	156	.....	p-stl..	.....	sol*...	36x4	36x7	.....	wd....	Hink..	4-4½x5½-32.5	....	cent...	.....	fin....	.....	cst....	sing...	.....	.....	s&l....	.....	....
Schwartz.....A	1	130	P&B..	p-stl..	s-flex..	pnu...	33x4½	33x4½	Sch...	wd....	Lyc...	4-3½x5 -19.6	2	ther...	own...	cst....	.....	cel....	sing...	West..	hand..	sl&i...	G&D..	none
Schwartz.....BW	1½	146	P&B..	p-stl..	s-flex..	sol*...	34x3½	34x7	Sch...	wd....	Buda..	4-3¾x4½-22.5	2	cent...	own...	cst....	Fed...	cel....	sing...	Bosch	hand..	lghtg..	G&D..	none
Schwartz.....CW	2½	150	P&B..	p-stl..	s-flex..	sol....	36x4	36x8	Sch...	wd....	Buda..	4-4½x5½-29.0	2	cent...	own...	cst....	Fed...	cel....	sing...	Bosch	hand..	lghtg..	G&D..	none
Schwartz.....DW	5	170	P&B..	p-stl..	s-flex..	sol....	36x6	40x12	Sth...	mt....	Buda..	4-4½x6 -32.4	2	cent...	own...	cst....	Fed...	cel....	sing...	Bosch	hand..	lghtg..	G&D..	none
Towmotor Tractor.....A	....	70	P&B..	p-stl..	rigid..	sol....	22x3½	22x3½d	West..	mt....	Wei...	4-3¾x5½-19.6	4	cent...	own...	cst....	S-W..	p-t....	sing...	Delco.	hand..	sl&i...	Delco.	none
Traylor.....E	4	168	.....	p-stl..	rigid..	sol....	36x5	40x10d	.....	mt....	Buda..	4-4½x6 -32.4	4	cent...	G&O..	fin....	G&O..	cst....	sing...	Spltf..	auto.	.....	.....	....
Traylor.....B	1¼	132	.....	p-stl..	rigid..	sol....	34x3½	34x5	Sch...	wd....	Buda..	4-3¾x5½-22.5	4	ther...	G&O..	.....	G&O..	cst....	sing...	Spltf..	auto.	.....	.....	....
Traylor.....C	2	138	.....	p-stl..	rigid..	sol....	36x4	36x7	Sch...	wd....	Buda..	4-4 x5½-25.6	4	cent...	G&O..	fin....	G&O..	cst....	sing...	Spltf..	auto.	.....	.....	....
Traylor.....D	3	150	.....	p-stl..	rigid..	sol....	36x4	36x8*	Sch...	wd....	Buda..	4-4¼x5½-29.0	4	cent...	G&O..	fin....	G&O..	cst....	sing...	Spltf..	auto.	.....	.....	....

Steam Trucks

Name and Model	Capacity in Pounds	Wheelbase in Inches	FRAME		TIRES			Wheels	BOILER						WATER		
						SIZE IN INCHES							BURNER		PRESSURE			CONDENSER	
			Material	Construction	Kind	Front	Rear		Location	Type	Heating Surface in Sq. in.	Horsepower	Type	Regulation	Normal in Lbs.	Maximum in Lbs.	Water Capacity in Gal.	Type	Circulation
Steamobile	10,000	157	I-beam.	.....	solid ...	36x6	42x9	c-st....	under hood	Wat-tube	.....	40	atomiz...	auto.....	.....	700	40	flat....	natural.

ABBREVIATIONS—Types of Construction

*****—other options
amid—amidships
auto—automatic
bevl—bevel
cel—cellular
cent—centrifugal
chn—chain
cst—cast
ctr—center
cylinders cast, 2 in pairs
cylinders cast, 4 in block
cylinders cast, 3 in threes
cylinders cast, 1 singly
cyl-ends—cylinder-ends
d—dual
d-d—dry-disk
d-p—dry-plate
dplx—from both motor & driveshaft
d-rd—double reduction
d-s—drive-shaft
elec—electric
ext-d-s—external drive-shaft
ext-f-w—external front wheel
ext-g—external gear
ext-jst — external jack-shaft
ext-r-w—external rear wheel
fab—fabric
fln—fluned tube
flex—flexible
f-m—fabric & metal
fric—friction
g-p—gear pump
grv—gravity
gset—from gearset
hyd—hydraulic
ind-c—individual clutch
int-g—internal gear
int-g-4 — internal gear drive on 4 wheels
int-r-w—internal rear wheel
jst—unit with jackshaft
l—left
l-b—loose ball
lghtg—lighting only
mtr—unit with motor
mt—metal (wheels)
mtl—metal (universal joint)
opt—optional
pist—piston pump
plan—planetary
pin—plain tube
pnu—pneumatic
pres—pressure
prog—progressive
prs—pressed steel
p&s—pneumatics in front solids in rear
p-stl—pressed steel
r—right
r&c—right & center
r-rd—radius rods
rol-c—rolled channel
rol-i—rolled I-beam
selec—selective
s-flex—semi-flexible
s-fr—sub-frame
sht—sheet
s&l—starting & lighting
sl&i-2—starting, lighting & ignition, 2 unit
sol—solid
sprgs—springs
sq-t—square tube
start—starting only
suct—suction
t-arm—torque arm
ther—thermo-syphon
t-p—two-point
t-t—torsion tube
vac—vacuum
wat-tube—water tube
wd—wood
w-d—multiple disk in oil
w-p—plate in oil
wr—wire
zz-t—zig-zag tube

ABBREVIATIONS—Makers of Parts.

*Other Options
A-Knt—Atwater-Kent
Al-Ch—Allis-Chalmers
Amer — American Magneto Co.
Arch—Archibald
Aut-L—Auto-Lite
Auto—Auto Wheel Co.
B-Beck—Borg & Beck
BCA—Bearings Co. of Am.
Berlg—Berling
Bim—Bimel
Bl&Fl—Blood & Flexite
B-Lipe—Brown-Lipe
Blood—Blood Bros.
Bl&P—Blood & Peters
Bl&Sp—Blood & Spicer
B-M—Bucyrus Mach. Tool
Brem—Bremer
Cart—Carter carburetor
Cas—G. M. Castle
CAS—C. A. S. products
C-D—Curran-Detroit Radiator Co.
Chgo—Chicago Mfg. Co.
Chic—Chicago Standard
Chmp—Champion Auto Spring Co.
Clrk—Clark Equip. Co.
Cocn—Corcoran Radiator Co.
Col—Columbia Axle Co.
Cont—Continental motor
Conn—Connecticut
Crn—Crane & MacMahon
Crn-S—Crane & MacMahon and Standard
Day—Dayton wheel
Detlaf—Detlaff
Det — Detroit Wheel & Rim
Detrt—Detroit G. & M.
Ditl—Disteel Wheel Co.
Pltw—Ditwiler Mfg. Co.
Dnet—Dyneto

Trend in Truck Design

(*Continued from page* 334)

Location of the steering gear at the left is approaching universal adoption, but a little over 5 per cent still have right hand drive. For what reason it is retained by even this number is not apparent, except in the case of cars for export to certain countries, or where a change from a model long manufactured with right hand drive would involve expense not commensurate with the advantage gained, a reason often applying or said to apply in the case of manufacturers who continue a practice long since abandoned by a very large majority of builders.

Pressed steel frames are now employed in the case of about three out of every four models. One in four employs structural steel, due it may be assumed, in most cases at least, to the expense of die equipment, for the structural steel frame seems to offer no advantage except easier length

oline Trucks—*Continued*

Received Too Late to Classify

ENGINE									TRANSMISSION										BRAKES		CONTROL			UNIVERSALS		Name and Model
GOVERNOR			SPEED		FUEL SYS.		CLUTCH		GEARSET				FINAL DRIVE					Springs Make			STEER'G GEAR					
Type	Make	Drive	Motor in r.p.m.	Truck in m.p.h.	Carbureter Make	Fuel Feed	Type	Make	Type	Make	Placed	Speeds	Type	Rear Axle Make	Total Gear Reduction	Propulsion Taken By	Torque Taken By		Foot	Hand	Placed	Make	Levers	Type	Make	
.....	.....	.....	.....	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	.....	...	int-g..	Clrk..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Birch.....
none..	.....	.....	2400	29	Buick..	grv..	cone..	own...	selec..	own...	mtr...	3	int-g..	Russl.	8.20	sprgs..	sprgs..	Aloy..	int-r-w.	int-r-w.	l...	Lavn..	ctr..	mtl	Unvsl.	Briscoe.....T34
cent..	LeR...	motor.	1500	12	.....	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	11.77	sprgs..	sprgs..	Mth..	.....	ext-d-s.	r...	Ross..	ctr..	mtl	Acme..	Clark Trucktractor...TB
cent..	LeR...	motor.	1500	12	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	11.77	sprgs..	sprgs..	Mth..	.....	ext-d-s.	r...	Ross..	ctr..	mtl	Acme..	Clark Trucktractor..MAA
cent..	LeR...	motor.	1500	12	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Clrk..	11.77	sprgs..	sprgs..	Mth..	.....	ext-d-s.	r...	Ross..	ctr..	mtl	Acme..	Clark Trucktractor....L
none..	none...	.....	1200	25	Zenith..	vac..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	worm.	Timkn	7.00	sprgs..	sprgs..	S-P...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Dart.....S
cent..	Pierce..	motor.	1200	15	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	worm.	Timkn	8.50	sprgs..	sprgs..	S-P...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Dart.....M
cent..	Pierce..	motor.	1200	10	Zenith..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Timkn	8.75	sprgs..	sprgs..	S-P...	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	Spicer..	Dart.....W
suct..	Mnrch.	motor.	1300	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	3	int-g..	Russl.	8.20	sprgs..	sprgs..	Dtr...	ext-r-w.	int-r-w.	....	Gem..	.....	.....	Unvsl.	Denby.....12
suct..	Mnrch.	motor.	1275	25	Stmbg..	grv..	d-p...	Fuller.,	selec..	Fuller..	mtr...	3	int-g..	Clrk..	6.50	sprgs..	sprgs..	Dtr...	ext-d-s.	int-r-w	l...	Gem..	.....	.....	Unvsl.	Denby.....33
suct..	Mnrch.	motor.	1275	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Russl.	8.85	sprgs..	sprgs..	Dtr...	ext-r-w.	int-r-w.	....	Gem..	.....	.....	Unvsl.	Denby.....134
suct..	Mnrch.	motor.	1275	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	mtr...	4	int-g..	Russl.	9.45	sprgs..	sprgs..	Dtr...	ext-r-w.	int-r-w.	....	Gem..	.....	.....	Unvsl.	Denby.....25
cent..	Dplx..	Dplx..	1050	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	int-g.	Clrk..	10.00	sprgs..	sprgs..	Dtr...	ext-d-s.	int-r-w.	....	Gem..	.....	.....	Unvsl.	Denby.....27
cent..	Dplx..	Dplx..	1050	....	Stmbg..	grv..	d-d...	Fuller..	selec..	Warn..	amid..	4	int-g..	Clrk..	12.55	sprgal.	sprgs..	Dtr...	ext-d-s.	int-r-w.	....	Gem..	.....	.....	Pet....	Denby.....210
.....	.....	.....	.....	....	Stmbg..	.....	d-d...	.....	selec..	.....	amid..	3	worm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Therm.	Patriot.....Revere
.....	.....	.....	.....	....	Stmbg..	.....	d-p...	.....	selec..	.....	amid..	4	worm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Therm.	Patriot.....Lincoln
.....	.....	.....	.....	....	Stmbg..	.....	d-p...	.....	selec..	.....	amid..	4	worm.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Therm.	Patriot.....Washington
none..	none...	none..	2000	40	Stmbg..	vac..	d-d...	M&E..	selec..	Dund..	mtr...	3	bevl...	Shel...	6.14	sprgs..	sprgs..	.....	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	M&E..	Schwartz.....A
suct..	Mnrch.	motor.	1200	18	Stmbg..	grv..	d-d...	M&E..	selec..	Dund..	mtr...	3	worm.	Shel...	6.50	sprgs..	sprgs..	Rowl.	int-r-w.	int-r-w.	l...	Ross..	ctr..	mtl	M&E..	Schwartz.....BW
suct..	Mnrch.	motor.	1100	16	Stmbg.	grv..	d-d...	M&E..	selec..	Dund..	mtr...	3	worm.	Shel...	8.75	sprgs..	sprgs..	Rowl.	int-r-w.	int-r-w.	l...	Ross...	ctr..	mtl	M&E..	Schwartz.....CWS
.....	Simp...	motor.	1200	14	Stmbg..	grv..	d-d...	Fuller..	selec..	Fuller..	amid..	4	worm.	Shel...	12.25	sprgs.	sprgs.	Rowl.	int-r-w.	int-r-w.	l...	Ross.	ctr..	mtl	M&E..	Schwartz.....DW
none..	.....	.....	1500	12	Schblr..	grv..	d-p...	B-Beck.	selec..	G-Lees.	mtr...	3	int-g.	Torbn.	8.00	frame	frame	S-P...	int-r-w.	int-r-w	l...	Ross..	ctr..	fab	Snead..	Towmotor Tractor.....A
.....	.....	.....	.....	.....	Zenith..	.....	d-d...	.....	selec..	.....	.....	4	worm.	Shel..	.....	.....	.....	.....	int-r-w.	.....	.....	Ross.	.....	.....	.....	Traylor.....E
cent..	Pierce..	motor.	.....	.....	Zenith..	.....	d-d...	.....	selec..	.....	.....	3	worm.	Shel..	.....	.....	.....	.....	int-r-w.	.....	l...	Ross.	.....	.....	.....	Traylor.....B
cent..	Pierce..	motor.	.....	.....	Zenith..	.....	d-d...	.....	selec..	.....	.....	3	worm.	Shel..	.....	.....	.....	.....	int-r-w.	.....	l...	Ross.	.....	.....	.....	Traylor.....C
cent..	Pierce..	motor.	.....	.....	Zenith..	.....	d-d...	.....	selec..	.....	.....	4	worm.	Shel.	.....	.....	.....	.....	int-r-w.	.....	l...	Ross.	.....	.....	.....	Traylor.....D

Steam Trucks

SYSTEM			ENGINE						TRANSMISSION					CONTROL					Name and Model
Feed Pump Type	Feed Control	Location	No. of Cylinders	Cylinders Cast	Valve Location	Valve Action	Valve Stroke	Reverses By	Final Drive	Gear-Ratio	Axle Type	Propulsion Taken By	Torque Taken By	Throttle	Hook-up	Reverse	Steering Wheel Location	Brake Lever Location	
plunger..	auto...	rear axle..	4	2	cyl-ends	Stokesbary	adjustable...	lever.....	Spur-gear...	3.00-1	floating	springs....	.....	lever.....	.....	lever.....	right*.....	center.....	Steam-O-Truck

ABBREVIATIONS—Makers of Parts—(Con)—

Dplx—Duplex governor
Drt—Detroit Pressed Steel Co.
Dtr—Detroit Products
Dtrt—Detroit lubricator
Dun—Dunbar Mfg. Co.
Dund—Dundore Mfg. Co.
Dunk—Dunkirk Axle Corp.
Dur—Durston Gear Corp.
Elyr—Elyria Steel Products Co.
E&M—English & Mersick
E&O—Eberly & Orris
Eismn—Eisemann
Ens—Ensign carburetor
Erie—Ericsson Mfg. Co.
Eurk—Eureka
Fed—Fedders
GB&S—Golden, Belknap & Schwartz
G&D—Gray & Davis
G&O—G & O Mfg. Co.
GCS—Garden City springs
Gem—Gemmer
G-Lees—Grant-Lees
Godn—Gordan Radiator Co.
Har—Harrison
Hart—Hartford
Harv—Harvey
Hay—Hayes Wheel Co.
H&D—Hoopes Bros. & Darlington
H&K—Hale & Kilburn
Her—Hercules
Hghy—Highway Engine Co.
Hink—Hinkley
H-Shaw—Hele-Shaw
H-S—Herschell-Spillman
Hyd—Hydraulic
Idl—Ideal
Int—Interstate
Iron—Iron City
Jacox—Jackson-Church-Wilcox
Jck—Jackson Auto Rad.
Jmst—Jamestown Car Parts
Jns—Phineas Jones & Co.
John—Johnson Co.
K&B—Kinsler & Bennet
Kel—Kelsey Wheel Co.
Kug—Kueng Radiator Co.
K.W.—K.W. Ignition Co.
Laur—Lauraine Magneto
Lavn—Lavine
LeR—Le Roi engine
Lght—Light Mfg. Co.
Liggt—Liggett Spring & Axle Co.
L-N—Leece-Neville Co.
Lng—Long
Lvgn—Livingston
Lyc—Lycoming
Marm—Maremont Mfg. Co.
McCn—McCanna
M&E—Merchant & Evans
McC—McCord
Mech—Mechanics Machine
Merl—Merrill Spring Co.
Mnrch—Monarch
Mod—Modine Mfg. Co.
Morg—Morgan Mfg. Co.
Math—Mather
Munc—Muncie
MWC—Motor Wheel Corp.
Natl—National Can Co.
Natn—National Axle Co.
N-E—North East
Own&Sp—Own & Spicer
P&B—Parish & Bingham
Pfx—Perfex radiator
Pgh—Pittsburgh Pressed Steel
Phro—Pharo Mfg. Co.
Pitt—Pittsburgh Model Engine Co.
Prsh—Parish Mfg. Co.
Prud—Prudden
Rayfld—Rayfield
Rowl—Wm. H. Rowland
Roy—Royer Wheel Co.
R-T—Rome-Turney
Russl—Russel Axle Co.
Sag—Saginaw
Sal—Salisbury
Savg—Savage Arms
Sch—Schwarz Wheel Co.
Schblr—Schebler
Shar—Sharon Pressed Steel Co.
Shel—Sheldon
Sim—Simms Magneto Co.
Simp—Simplex
S-K—Slick Knox Steel Co.
Smh—A. O. Smith
Sn & Ac—Snead & Acme
Sn&Sp—Snead & Spicer
S-P—Standard Parts Co.
Sp&Fl—Spicer & Flexite
Spltf—Splitdorf
Sp-P—Spring Perch Co.
Sp&Pet—Spicer & Peters
Stan—Standard radiator
Stand—Standard Steel Spring Co.
Sterl—Sterling bearings
Stmbg—Stromberg
Stn—Standard Wheel Co.
Sth—Smith steel wheel
S-W—Sparks-Withington
Th&Ba Thermoid & Baker
Th&Bl—Thermoid & Blood
Therm—Thermoid
Th—Sp—Thermoid & Spicer
Till—Tillotson
Timkn—Timken
Torbn—Torbensen
Trav—Traverse City Iron Works
T-S—Turner-Seymour
Tuth—Tuthill
Unv—Universal
Unvsl—Universal Mach.
U.P.—U. P. Products Co.
U.S.—U. S. Spring Co.
Wab—Wabash Radiator Co.
Warn—Warner
Wau—Waukesha
Way—Wayne Wheel Co.
Wei—Weidley
West—Westinghouse
We-W—Western Wheel Co.
Wis—Wisconsin Parts
Wol—Wohlrab
W-S—West Steel Castings Co.
Wsc—Wisconsin engine
Yng—Youngstown Pressed Steel Co.

variation over a well constructed pressed steel frame.

An increasing number of radiators are of the tubular core cast case type. Less than 20 per cent use cellular cores, and these are mostly applied to the light pneumatic tired jobs. About 80 per cent of all models use cast case radiators, while of the remaining 20 per cent about one-third use sheet metal two-thirds pressed steel.

The Hotchkiss drive is employed in about 57 per cent of models as against about 55 per cent in 1920. Nearly 60 per cent of models are fitted with centrifugal type governors—less than last year because fewer trucks are fitting any governor. Quite a number of truck models are fitted with fabric universals exclusively, and a larger number are a combination of fabric and metal universals, but about 80 per cent of all models use only metal joints, though the percentage of fabric joints is increasing.

British Car Practices

By M. W. Bourdon

(*See page* 322)

PERCENTAGES OF BRITISH CARS INCORPORATING VARIOUS DESIGN FEATURES

Number of Cylinders

4-cylinder .....76.5 per cent
6-cylinder .....16.0 per cent
2-cylinder ..... 3.5 per cent
8-cylinder ..... 2.5 per cent
3-cylinder ..... 1.5 per cent

Cylinder Type

L head .....72.0 per cent
Valve in head.....21.5 per cent
Sleeve valve ..... 5.0 per cent
Overhead inlet ..... 1.5 per cent

Overhead Valve Drive

Overhead camshaft..57 per cent
Push rods .....43 per cent

Cylinder Casting

Fours in block.....96 per cent
Fours in pairs..... 4 per cent

Cylinder Heads

Integral .....51 per cent
*Detachable .....49 per cent

*Unit cylinder and crankcase 40 per cent.

Piston Material

Cast iron .....70 per cent
Aluminum .....26 per cent
Steel ..... 3 per cent
Aluminum and cast iron ..... 1 per cent

Connecting Rods

H section .....95 per cent
Tubular ..... 5 per cent

Number of Piston Rings

Three .....60 per cent
Two .....30 per cent
More than three.....10 per cent

Wrist Pin

Fixed in piston.....52 per cent
Floating .....28 per cent
Fixed in rod.....20 per cent

Lubrication Systems

Trough (circulating splash) .....51 per cent
Hollow shaft (pressure) .....49 per cent

Oil Pump Type

Gear (twin pinion)...70 per cent
Plunger .....21 per cent
Multi plunger ..... 5 per cent
Eccentric ..... 4 per cent

Fuel Feed

Gravity .....56 per cent
Vacuum .....30 per cent
Pressure .....14 per cent

Water Circulation

Thermosyphon .....48 per cent
Pump .....44 per cent
Assisted thermo-syphon ..... 8 per cent

(*Continued on next page*)

Truck Exports for Eight

	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31, 1918	Calendar Year 1919	1920	Total
Europe;										
Austria	2 $3,595	3 $7,455	.....	.....	.....	.....	.....	10 $18,500	3 $1,348	18 $30,898
Azores and Madeira Islands	.....	.....	.....	.....	.....	.....	.....	3 $3,816	1 $3,650	4 $7,466
Belgium	.....	.....	100 $365,000	.....	.....	.....	.....	138 $307,778	195 $209,985	433 $517,763
Bulgaria	2 $1,528	.....	.....	.....	.....	.....	.....	.....	4 $9,723	6 $11,251
Denmark	3 $2,120	.....	44 $25,033	41 $36,413	58 $81,414	2 $3,800	.....	643 $1,339,380	296 $615,448	1,087 $2,103,608
France	6 $10,709	2 $5,070	4,990 $13,523,843	5,681 $17,709,579	4,264 $13,854,903	2,754 $10,001,636	2,025 $8,011,335	3,521 $15,143,226	135 $434,943	23,378 $78,695,244
Finland	.....	.....	.....	.....	.....	.....	.....	10 $12,783	104 $202,719	114 $215,502
Germany	4 $4,029	24 $18,462	4 $2,800	.....	.....	.....	.....	.....	47 $41,958	79 $67,249
Gibraltar	.....	.....	.....	.....	.....	27 $58,325	.....	.....	8 $5,763	35 $64,088
Greece	1 $1,176	1 $1,800	142 $426,570	45 $98,815	3 $2,000	14 $32,000	.....	37 $80,891	70 $100,073	313 $743,325
Hungary	.....	.....	.....	.....	.....	.....	.....	.....	1 $3,164	1 $3,164
Iceland and Faroe Islands	.....	.....	.....	.....	.....	1 $2,245	.....	26 $21,661	38 $22,321	65 $46,227
Italy	.....	1 $1,229	1 $8,000	5 $14,655	65 $159,775	52 $28,055	26 $87,577	7 $24,310	37 $67,775	214 $391,376
Malta, Gozo, and Cyprus Islands	.....	.....	.....	.....	.....	.....	.....	.....	9 $10,557	9 $10,557
Netherlands	2 $4,489	1 $1,452	9 $19,069	50 $93,797	36 $55,305	.....	.....	122 $294,772	528 $593,491	748 $1,062,368
Norway	2 $2,200	2 $3,852	3 $4,689	81 $121,480	162 $266,741	40 $133,227	83 $212,574	815 $1,787,473	829 $1,434,712	2,017 $3,966,948
Poland and Danzig	.....	.....	.....	.....	.....	.....	.....	.....	22 $35,473	22 $35,473
Portugal	1 $1,400	8 $12,075	5 $10,291	295 $1,117,681	21 $45,087	12 $36,914	10 $42,300	30 $76,728	166 $284,197	528 $1,626,673
Roumania	12 $12,000	.....	.....	.....	.....	.....	.....	114 $94,951	75 $89,370	201 $196,321
Russia in Europe	13 $34,163	2 $5,322	2,251 $7,666,883	3,909 $12,544,258	1,733 $5,428,979	406 $1,562,303	.....	2 $2,503	104 $64,785	8,412 $29,809,693
Serbia, Montenegro & Albania	.....	.....	10 $6,300	20 $65,000	.....	.....	.....	4 $5,700	3 $1,511	37 $80,022
Spain	1 $1,400	.....	1 $1,800	30 $57,277	29 $55,808	46 $97,910	33 $87,100	209 $409,493	567 $1,004,833	916 $1,715,621
Sweden	.....	1 $900	10 $17,600	19 $29,050	6 $10,879	7 $10,360	.....	211 $444,695	821 $1,416,124	1,075 $1,929,608
Switzerland	.....	.....	.....	.....	.....	.....	.....	33 $40,044	78 $49,767	111 $89,811
Turkey in Europe	.....	1 $2,000	2 $8,009	.....	.....	.....	.....	82 $118,005	120 $165,400	205 $293,414
England	184 $119,468	203 $189,099	5,306 $14,042,325	8,268 $18,723,403	6,525 $17,061,105	4,805 $13,438,981	830 $2,456,993	890 $1,342,575	4,995 $7,148,880	32,006 $74,522,829
Scotland	.....	.....	4 $11,250	224 $271,745	.....	447 $1,203,328	.....	2 $1,779	162 $183,945	839 $1,672,047
Ireland	.....	.....	1 $7,033	8 $39,776	.....	.....	2 $4,276	15 $19,948	45 $40,555	71 $111,588
North America:										
British Honduras	.....	.....	.....	.....	.....	2 $3,700	1 $834	.....	21 $15,342	24 $19,876
Canada	489 $1,004,237	247 $474,724	306 $705,213	387 $724,817	636 $945,047	1,108 $1,381,542	895 $1,192,833	1,858 $2,896,325	2,149 $4,187,597	8,075 $13,212,335
Central Amer. States:										
Costa Rica	2 $3,643	8 $10,571	2 $4,165	.....	1 $900	5 $10,245	.....	1 $504	14 $22,553	33 $52,581
Guatemala	.....	.....	.....	2 $4,916	4 $4,323	3 $5,512	.....	10 $16,761	25 $34,105	44 $65,617
Honduras	1 $3,000	.....	6 $12,500	6 $14,540	4 $4,094	6 $3,373	.....	7 $9,589	19 $19,770	49 $66,866
Nicaragua	.....	.....	.....	1 $2,500	.....	1 $2,509	2 $5,742	11 $16,026	23 $32,253	38 $59,030
Panama	.....	5 $7,243	6 $12,010	32 $55,171	75 $97,970	47 $47,859	16 $20,504	38 $39,148	68 $53,127	287 $333,038
Salvador	.....	.....	.....	1 $1,300	1 $868	4 $14,811	1 $175	4 $8,897	42 $118,585	53 $144,636
Mexico	35 $83,363	12 $17,509	8 $14,492	51 $100,500	218 $198,151	365 $525,664	201 $260,968	938 $1,205,664	1,281 $1,973,994	3,109 $4,380,305
Miquelon, Langley & St. Pierre Islands	.....	.....	.....	.....	.....	.....	.....	6 $6,000	.....	6 $6,000
Newfoundland & Labrador	4 $8,845	1 $1,221	1 $750	1 $1,692	1 $2,675	2 $7,250	5 $2,997	10 $23,306	12 $54,907	37 $103,643
West Indies, British:										
Barbados	.....	.....	.....	.....	1 $1,506	2 $3,400	5 $11,792	15 $14,394	58 $62,150	81 $93,242
Jamaica	4 $9,234	3 $9,250	3 $7,292	9 $18,524	6 $8,285	10 $6,775	2 $800	36 $42,828	215 $313,578	288 $416,666
Trinidad & Tobago	.....	1 $2,000	.....	2 $1,974	2 $5,722	14 $18,361	7 $15,089	69 $86,479	202 $271,451	297 $331,076
Other British	.....	.....	.....	6 $11,327	1 $500	28 $89,914	4 $3,304	25 $14,301	56 $38,168	120 $157,514
Cuba	14 $23,639	19 $33,500	21 $34,607	117 $176,647	397 $722,519	554 $1,130,982	279 $539,070	915 $1,955,509	1,944 $4,030,246	4,260 $9,546,719
Danish (Virgin Isl. of U. S.)	1 $4,250	.....	.....	.....	.....	2 $2,845	.....	1 $3,350	168 $412,940	172 $423,385
Dominican Republic	1 $1,858	1 $1,800	2 $3,372	4 $5,173	22 $23,640	21 $13,323	8 $11,597	48 $75,953	213 $226,982	320 $363,698
Dutch	.....	1 $595	1 $1,463	.....	2 $2,095	.....	.....	3 $3,095	18 $8,542	25 $15,790
French	.....	.....	2 $3,975	1 $2,310	7 $13,305	26 $49,626	2 $3,650	58 $77,085	71 $55,607	167 $205,558
Haiti	3 $5,553	.....	.....	.....	2 $1,324	11 $10,578	2 $1,200	8 $6,798	27 $51,358	53 $76,711

Years Show Progress

	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31, 1918	Calendar Year 1919	1920	Total
South America:										
Argentina	35 $78,000	48 $65,225	3 $2,910	45 $33,063	141 $146,255	51 $50,124	3 $4,094	145 $291,430	354 $825,333	785 $1,496,434
Bolivia	.....	.....	.....	.....	20 $48,590	14 $24,958	12 $38,716	8 $12,376	13 $21,895	67 $146,535
Brazil	36 $75,073	13 $20,449	3 $2,861	11 $19,635	14 $8,300	24 $31,133	21 $19,167	200 $199,738	1,540 $1,191,577	1,862 $1,567,933
Chile	.....	2 $10,743	.....	17 $46,566	69 $160,696	220 $282,638	85 $136,376	88 $131,055	299 $326,216	780 $1,094,290
Colombia	3 $6,112	.....	1 $1,237	4 $1,236	2 $4,998	3 $7,100	2 $3,285	38 $39,341	275 $291,410	328 $354,719
Ecuador	1 $2,017	.....	.....	2 $3,378	1 $2,050	3 $6,876	4 $6,520	5 $6,865	46 $85,898	62 $113,601
Guiana, British	.....	.....	1 $900	.....	1 $1,529	7 $5,100	1 $2,600	35 $24,119	123 $72,966	168 $104,614
Dutch	.....	.....	.....	1 $1,037	.....	.....	1 $1,000	1 $506	6 $4,111	9 $6,655
French	.....	.....	.....	.....	.....	.....	.....	4 $2,061	1 $3,061	5 $5,122
Peru	3 $5,301	2 $3,484	5 $5,830	25 $48,776	73 $155,834	52 $139,295	207 $215,175	900 $775,398	1,267 $1,299,094
Uruguay	7 $19,280	1 $865	.....	2 $5,818	4 $10,437	16 $15,809	2 $2,000	68 $79,196	113 $113,479	213 $246,884
Venezuela	23 $34,291	12 $28,228	3 $7,164	6 $13,029	14 $28,502	16 $12,410	2 $2,200	41 $24,579	186 $144,308	117 $294,711
Asia:										
Aden	.....	.....	.....	.....	.....	.....	.....	1 $922	2 $7,188	3 $8,110
China	.....	7 $12,700	.....	39 $9,799	9 $14,287	23 $26,236	31 $46,595	273 $596,715	261 $464,845	643 $1,169,177
Kwantung (leased territory)*	.....	.....	1 $2,451	.....	.....	.....	.....	4 $6,335	82 $193,549	87 $202,335
Chosen (Korea)	1 $3,500	.....	.....	3 $5,027	.....	2 $1,629	.....	.....	.....	6 $10,156
East Indies:										
British India	.....	7 $12,091	7 $8,680	135 $208,067	126 $205,023	11 $20,275	1 $2,118	260 $563,339	1,534 $3,069,542	2,081 $4,083,135
Straits Settlements	2 $5,588	7 $14,381	.....	17 $25,169	57 $61,881	70 $113,554	44 $64,425	115 $229,624	447 $857,410	759 $1,371,982
Other British	.....	.....	1 $3,300	20 $27,841	26 $38,970	3 $7,138	.....	16 $27,700	69 $152,849	135 $257,798
Dutch	2 $4,840	7 $14,232	11 $9,567	58 $82,586	108 $137,609	68 $162,749	139 $313,725	324 $689,225	1,182 $2,920,663	1,899 $4,335,196
French	.....	.....	.....	.....	.....	2 $3,500	3 $7,299	16 $11,556	141 $117,984	162 $139,339
Hongkong	.....	.....	1 $4,780	3 $6,304	.....	8 $5,371	8 $10,500	19 $25,547	26 $55,377	65 $107,879
Japan	21 $32,770	1 $900	1 $3,382	15 $14,528	70 $59,198	279 $317,787	381 $636,692	1,143 $1,736,439	1,233 $1,590,760	3,144 $4,392,456
Persia	.....	.....	.....	.....	.....	4 $2,712	.....	.....	20 $10,601	24 $13,313
Russia in Asia	.....	.....	596 $1,903,221	1,170 $3,546,435	515 $1,662,144	.....	15 $18,200	21 $41,482	9 $18,491	2,326 $7,189,973
Siam	.....	.....	.....	9 $7,036	8 $6,700	6 $4,535	2 $4,867	8 $12,411	5 $8,965	38 $44,514
Turkey in Asia	.....	1 $1,354	5 $26,282	.....	2 $1,143	.....	.....	14 $27,695	93 $126,775	115 $183,249
Oceania, British:										
Australia	17 $23,027	32 $37,378	57 $84,142	201 $295,538	194 $237,159	109 $163,405	15 $26,274	418 $565,406	987 $1,441,366	2,030 $2,873,695
New Zealand	1 $1,201	39 $61,599	20 $31,575	93 $149,848	75 $119,833	74 $145,764	52 $59,690	225 $501,488	494 $1,115,886	1,077 $2,186,884
Other British	.....	.....	.....	2 $2,612	1 $1,688	2 $2,404	.....	9 $9,779	6 $6,250	20 $22,733
French	2 $3,400	4 $7,625	1 $860	1 $2,750	2 $6,480	5 $1,000	1	1 $600	4 $9,858	20 $26,003
German	.....	.....	.....	1 $1,530	3 $2,377	4 $5,518	2 $2,213	8 $7,020	9 $4,706	27 $23,364
Philippine Islands	43 $91,809	38 $64,805	27 $62,132	58 $88,286	53 $57,457	163 $215,106	32 $56,815	516 $798,540	1,155 $1,818,221	2,085 $3,253,171
British Africa:										
West	.....	1 $1,260	.....	7 $13,173	115 $124,574	27 $20,136	13 $15,097	215 $254,836	780 $1,137,335	1,158 $1,566,411
South	11 $9,476	12 $11,539	15 $40,280	36 $54,519	34 $82,957	70 $107,085	23 $26,750	57 $102,992	237 $418,535	495 $854,133
East	.....	.....	.....	.....	.....	1 $787	.....	6 $5,010	8 $17,338	15 $23,135
Belgian Kongo	.....	.....	.....	.....	.....	.....	.....	3 $3,196	13 $8,470	16 $11,666
Canary Islands	.....	1 $1,203	.....	.....	1 $575	.....	.....	5 $4,312	11 $32,311	18 $38,401
Egypt	.....	.....	.....	.....	4 $9,624	.....	.....	15 $13,285	74 $69,492	93 $92,401
French Africa	1 $858	.....	.....	.....	.....	18 $12,963	11 $9,217	44 $47,157	337 $352,925	411 $423,120
German Africa	.....	.....	.....	.....	.....	.....	.....	7 $3,544	11 $11,405	18 $14,949
Italian Africa	.....	.....	.....	.....	.....	.....	.....	.....	5 $11,500	5 $11,500
Kamerun	.....	.....	.....	.....	.....	.....	.....	.....	9 $7,308	9 $7,308
Liberia	.....	.....	.....	.....	.....	.....	.....	.....	2 $1,156	2 $1,156
Morocco	.....	.....	.....	7 $9,675	.....	.....	.....	13 $13,410	44 $24,376	64 $47,461
Portuguese Africa	.....	1 $2,604	.....	1 $2,803	1 $2,500	.....	4 $7,725	4 $6,408	34 $49,409	45 $71,449
Spanish Africa	.....	.....	.....	.....	.....	.....	.....	.....	1 $2,118	1 $2,118
Total trucks										115,241
Total value										$271,904,772

*Previous to 1918 listed as British, French and Japanese China.

British Car Practices

PERCENTAGES OF BRITISH CARS INCORPORATING VARIOUS DESIGN FEATURES

(*Continued*)

Radiator Core
Cellular .....68 per cent
Tubular .....32 per cent

Ignition
Magneto .....89 per cent
Battery ..... 6 per cent
Magneto and battery 5 per cent

Distribution Gearing
Chain .....55 per cent
Skew pinion .....30 per cent
Straight pinion .....13 per cent
Worm ..... 2 per cent

Chain Distribution
Non-adjustable .....51 per cent
Adjustable .....49 per cent

Clutches
Cone .....61 per cent
Single disc .....27 per cent
Multiplate ..... 2 per cent

Gearset Mounting
Amidships .....68 per cent
On engine .....25 per cent
On axle ..... 4 per cent
On torque tube..... 3 per cent

Number of Gears Change
Four speeds.....50 per cent
Three speeds.....50 per cent

Propeller Shafts
Open .....50 per cent
Enclosed .....45 per cent
Semi-enclosed ..... 5 per cent

Propeller Shaft Joints
Disk .....34 per cent
Plain bearing star...31 per cent
Sliding block (pot)...27 per cent
Ball or roller star.... 8 per cent

Final Drives
Spiral bevel .....46 per cent
Bevel .....28 per cent
Worm .....26 per cent

Brake Location
Both on rear wheels.61 per cent
Transmission and wheels .....39 per cent
Transmission brakes:
External .....81 per cent
Internal .....19 per cent

Wheel Brakes
Internal .....90 per cent
External .....10 per cent

Rear Springs
Half elliptic .....48 per cent
Cantilever .....21 per cent
Quarter elliptic.....16 per cent
Three-quarter elliptic.15 per cent

Front Springs
Half elliptic .....88 per cent
Quarter elliptic .....10 per cent
Cantilever ..... 1 per cent
Transverse ..... 1 per cent

Wheels
Pressed steel hollow spoked .....56 per cent
Wire .....20 per cent
Disk .....20 per cent
Wood ..... 4 per cent

British Truck Chas

(Compiled for Automotive

Number	Name	Load Capacity Lb.	Wheelbase In.	Track In.	Type of Frame	Cylinders No-Bore-Stk	Normal R.P.M.	Cylinder Arrangement	Cylinder Type	Detachable Cylinder Head	Lubrication System	Water Circulation	Dynamo Lighting
1	A.E.C.	6270	170	70	Flitch	4-3.94x5.52	1050	Pairs	L	No	Trough	Pump	Yes
2	A.E.C.	8960	170	68	Pressed	4-4.78x5.90	1000	Pairs	L	No	Trough	Pump	Yes
3	Albion	2690	129	61	Pressed	4-3½x5	1250	Block	L	Yes	H. Shaft	Pump	Extra
4	Albion	3380	132	61	Rolled	4-3½x5½	1100	Pairs	L	No	H. Shaft	Pump	Extra
5	Albion	5600	157	70	Rolled	4-4½x5	1150	Block	L	No	H. Shaft	Pump	Extra
6	Albion	8960	173	70	Rolled	4-4½x5	1150	Block	L	No	H. Shaft	Pump	Extra
7	Austin	3380	126	60	Pressed	4-3¾x5	1200	Block	L	Yes	H. Shaft	Pump	Extra
8	Auto-Carrier	900	106	46	Pressed	4-2.73x3.94	....	Block	I	Yes	H. Shaft	Thermo	Yes
9	Beardmore	1700	100	54	Pressed	4-3.15x4.78	1200	Block	L	Yes	H. Shaft	Pump	Extra
10	Belsize	1350	99	56	Pressed	4-3.54x4.33	1000	Block	L	No	H. Shaft	Pump	Extra
11	Bristol	8960	170	70	Pressed	4-4½x5¾	1400	Pairs	L	No	Trough	Thermo	Yes
12	Caledon	8960	171	66	Pressed	4-4¼x5½	1200	Pairs		Yes	H. Shaft	Pump	Extra
13	Caledon	13500	171	66	Pressed	4-4¾x5½	1200	Pairs	L	No	H. Shaft	Pump	Extra
14	Churchill	7900	180	65	Rolled	4-5 x6	1000	Pairs	L	No	H. Shaft	Pump	Extra
15	Commer	2800	132	66	Pressed	4-3.74x4.78	1200	Pairs	L	No	Trough	Thermo	Extra
16	Commer	4480	144	66	Pressed	4-3.94x4.78	1200	Pairs	L	No	Trough	Thermo	Extra
17	Commer	7900	165	68	Rolled	4-3.94x5.52	1000	Pairs	L	No	Trough	Thermo	Extra
18	Commer	11000	162	72	Rolled	4-4.53x5.52	1000	Pairs	L	No	Trough	Thermo	Extra
19	Daimler	5600	138	63	Flitch	4-3.74x5.52	1000	Pairs		Yes	Trough	Pump	Extra
20	Daimler	5600	162	63	Flitch	4-3.74x5.52	1000	Pairs		Yes	Trough	Pump	Extra
21	Dennis	5600	144	62	Pressed	4-4.13x5.90	1000	Pairs	T	No	Trough	Pump	Extra
22	Dennis	9000	156	66	Pressed	4-4.53x5.90	1000	Pairs	T	No	Trough	Pump	Extra
23	Dennis	13500	170	66	Pressed	4-4.53x5.90	1000	Pairs	T	No	Trough	Pump	Extra
24	Enfield-Allday	4500	147	66	Pressed	4-3.94x5.12	1000	Pairs	T	No	H. Shaft	Thermo	Extra
25	Guy	5600	148	60	Pressed	4-4 x5½	1000	Block	L	Yes	H. Shaft	Pump	Extra
26	Halley	7900	160	62	Rolled	6-3½x6	1200	Threes	L	Yes	Trough	Pump	Extra
27	Hallford	4000	130	62	Pressed	4-3.94x5.52	1000	Pairs	L	No	Trough	Pump	Extra
28	Hallford	5600	148	64	Pressed	4-3.94x5.52	1000	Pairs	L	No	Trough	Pump	Extra
29	Hallford	6800	144	70	Pressed	4-4.33x5.52	1000	Pairs	L	No	Trough	Pump	Extra
30	Hallford	9000	162	72	Pressed	4-4.33x5.52	1000	Pairs	L	No	Trough	Pump	Extra
31	Hallford	11000	180	72	Pressed	4-4.78x5.52	1000	Pairs	L	No	Trough	Pump	Extra
32	Karrier	6800	168	66	Pressed	4-5 x6	1000	Pairs	L	No	Trough	Pump	Yes
33	Karrier	9000	168	66	Pressed	4-5 x6	1000	Pairs	L	No	Trough	Pump	Yes
34	Karrier	11000	168	66	Pressed	4-5 x6	1000	Pairs	L	No	Trough	Pump	Yes
35	Leyland	4500	141	65	Pressed	4-4½x5	1000	Pairs	L	No	H. Shaft	Pump	Extra
36	Leyland	6800	157	65	Pressed	4-4½x5	1000	Pairs	L	No	H. Shaft	Pump	Extra
37	Leyland	9000	168	65	Pressed	4-4⅝x6	1000	Pairs	L	No	H. Shaft	Pump	Extra
38	Leyland	11000	181	65	Pressed	4-5 x6	1000	Pairs	L	No	H. Shaft	Pump	Extra
39	Leyland	13500	190	65	Pressed	4-5 x6	1000	Pairs	L	No	H. Shaft	Pump	Extra
40	Maudslay	6800	162	66	Rolled	4-4½x5	1000	Pairs	I	No	H. Shaft	Pump	Extra
41	Maudslay	9000	162	66	Rolled	4-5 x5	1000	Pairs	I	No	H. Shaft	Pump	Extra
42	Maudslay	11000	174	66	Rolled	4-5 x5	1000	Pairs	I	No	H. Shaft	Pump	Extra
43	Maudslay	13500	186	66	Rolled	4-5 x5	1000	Pairs	I	No	H. Shaft	Pump	No
44	Pagefield	9000	164	69	Pressed	4-4¾x5½	1000	Pairs	L	No	H. Shaft	Pump	Extra
45	Palladium	10000	176	68	Pressed	4-4½x5½	1000	Pairs	L	No	Trough	Pump	Extra
46	Scammell*	18000	230	64	Pressed	4-5 x5½	1000	Pairs	I	Yes	H. Shaft	Pump	Extra
47	Scammell*	22000	254	64	Pressed	4-5 x5½	1000	Pairs	I	Yes	H. Shaft	Pump	Extra
48	Star	3400	138	57	Pressed	4-3.54x5.90	1500	Pairs	L	No	H. Shaft	Pump	Extra
49	Star	5600	150	60	Pressed	4-3.54x5.90	1500	Pairs	L	No	H. Shaft	Pump	Extra
50	Star	6800	150	60	Pressed	4-3.54x5.90	1500	Pairs	L	No	H. Shaft	Pump	Extra
51	Straker-Squire	11000	174	72	Pressed	4-4½x6½	1000	Block	I	Yes	H. Shaft	Pump	Extra
52	Tilling-Stevens	5600	144	57	Pressed	4-4.13x4.92	1000	Pairs	L	No	Trough	Pump	Extra
53	Tilling-Stevens†	9000	174	68	Pressed	4-4¾x5½	1000	Pairs	L	No	Trough	Pump	Extra
54	Thorneycroft	5600	144	62	Pressed	4-4 x5½	1000	Block	L	No	H. Shaft	Pump	Extra
55	Thorneycroft	7900	156	67	Pressed	4-4½x6	1000	Pairs	T	No	H. Shaft	Pump	Extra
56	Thorneycroft	9500	163	67	Pressed	4-4½x6	1000	Pairs	T	No	H. Shaft	Pump	Extra
57	Thorneycroft	13500	169	71	Pressed	4-4½x6	1000	Pairs	T	No	H. Shaft	Pump	Extra
58	Vulcan	3400	137	56	Pressed	4-3.54x5.12	1200	Block	L	No	Trough	Pump	Extra
59	W. & G.	4500	134	60	Pressed	4-3.74x5.52	850	Block	L	No	H. Shaft	As'td Thermo	Extra
60	W. & G.	5600	136	60	Pressed	4-3.74x5.52	850	Block	L	No	H. Shaft	As'td Thermo	Extra

†Gasoline electric. *Six Wheeler.

Magneto ignition on all trucks; fixed spark timing on 9, 10, 19, 20, 52, 53; honeycomb radiator, 10; plain tube, 25; others flanged tube; sheet metal radiator shell, 9, 10; other radiator shells cast. Vacuum fuel feed, 10, 25, 43, 51; others gravity feed; unit power plants, 7, 10; pneumatic tires, 8, 9, 10; optional tire equipment, 1, 3, 4, 12, 45, 58, 59, 60; other tire equipment solid. All hand brakes internal expanding.

Percentage of Various Design Features

Cylinder Number

All four-cylinders, except one make with one model.

Cylinder Type

L head .....71 per cent
T head .....12 per cent
Valve in head .....13 per cent
Sleeve valve ..... 2 per cent
Overhead inlet ..... 2 per cent

Cylinder Heads

Integral .....80 per cent
Detachable .....20 per cent

Lubricating Systems

Hollow shaft (pressure).....57 per cent
Trough (circulating splash).43 per cent

Fuel Feed

Gravity .....93 per cent
Vacuum ..... 7 per cent

Water Circulation

Pump .....85 per cent
Thermo-syphon .....12 per cent
Assisted thermo-syphon ..... 3 per cent

Radiators

Vertical tubes .....84 per cent
Horizontal tubes .....16 per cent

Ignition

Magneto .....100 per cent
Variable timing ..... 90 per cent
Impulse starter ..... 10 per cent

sis Specifications

Industries by M. W. Bourdon)

Electric Starter	Governor	Clutch	No. of Gears	Gear Shift Lever	Final Drive	High Gear Ratio	Propeller Shaft	Universal Joints	BRAKES			Road Wheels	Steering Pivots	Number
									Foot Operated		Hand			
									Position	Type	Type			
No	No	Cone	3	Right	Worm	8.5	Open	Star (Ball)	Wheels	Int	Int	Disk	Vert	1
No	No	Cone	4	Right	Worm	8.5	Open	Star (Ball)	Wheels	Int	Int	Disk	Vert	2
Extra	Yes	Plate	3	Right	Worm	4.5	Open	Star	Shaft	Ext	Int	Cast	Inclined	3
Extra	Yes	Plate	3	Right	Bevel	....	Open	Star & Block	Shaft	Ext	Int	Cast	Vert	4
Extra	Yes	Plate	3	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	5
Extra	Yes	Plate	3	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	6
Extra	No	Plate	4	Central	Worm	8	Open	Block	Shaft	Ext	Int	Wood	Vert	7
Extra	No	Plate	3	Right	Worm	4.5	Enclosed		Wheels	Int	Trans	Disk	Vert	8
Extra	No	Cone	4	Right	Bevel	4.28	Open	Fab. Disk	Trans	Ext	Int	Wood	Vert	9
No	No	Cone	4	Right	Bevel	3.6	Open	Leather Disk	Wheels	Int	Int	Disk	Vert	10
No	Yes	Plate	4	Central	Worm	7	Open	Star	Shaft	Ext	Int	Cast	Inclined	11
Extra	Yes	Cone	4	Right	Worm	8½	Open	Star	Shaft	Ext	Int	Cast	Vert	12
Extra	Yes	Cone	4	Right	Chain	....			Shaft	Ext	Int	Cast	Vert	13
No	Opt	Cone	4	Right	Chain	....		Fab. Disk	Shaft	Ext	Int	Disk	Vert	14
No	No	Cone	3	Right	Worm	6.25	Open	Star & Block	Shaft	Ext	Int	Cast	Inclined	15
No	No	Cone	3	Right	Worm	7.33	Semi	Star	Shaft	Ext	Int	Cast	Inclined	16
No	No	Cone	3	Central	Chains	7.5			Shaft	Ext	Int	Cast	Inclined	17
No	No	Cone	3	Central	Chains	9.2			Shaft	Ext	Int	Cast	Inclined	18
No	No	Cone	4	Right	Worm	7.25	Open	Star (Ball)	Wheels	Int	Int	Cast	Vert	19
No	No	Cone	4	Right	Worm	7.25	Open	Star (Ball)	Wheels	Int	Int	Cast	Vert	20
No	No	Plate	4	Central	Worm	6.75	Open	Star (Ball)	Shaft	Ext	Int	Cast	Vert	21
No	No	Cone	4	Right	Worm	7.75	Semi	Star	Shaft	Ext	Int	Cast	Vert	22
No	No	Cone	4	Right	Worm	8.75	Semi	Star	Shaft	Ext	Int	Cast	Vert	23
Extra	Yes	Cone	3	Right	Chains	8		Fab. Disk	Shaft	Ext	Int	Disk	Vert	24
Extra	No	Cone	4	Right	Double Reduc	6.83	Open	Star & Block	Trans	Ext	Int	Cast	Vert	25
Extra	No	Plate	4	Right	Worm	7.66	Open	Fab. Disk	Trans	Int	Int	Cast	Vert	26
Extra	Yes	Cone	3	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	27
Extra	Yes	Cone	3	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	28
Extra	Yes	Cone	4	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	29
Extra	No	Cone	4	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	30
Extra	No	Cone	4	Right	Chains	....			Shaft	Ext	Int	Cast	Vert	31
Extra	No	Cone	4	Right	Double Reduc	6.65	Semi	Disk, Block	Shaft	Ext	Int	Cast	Vert	32
Extra	No	Cone	4	Right	Double Reduc	8.23	Semi	Disk, Block	Shaft	Ext	Int	Cast	Vert	33
Extra	No	Cone	4	Right	Double Reduc	9.52	Semi	Disk, Block	Shaft	Ext	Int	Cast	Vert	34
Extra	Yes	Cone	4	Right	Worm	7	Semi	Disk	Shaft	Ext	Int	Cast	Inclined	35
Extra	Yes	Cone	4	Right	Worm	7.5	Semi	Disk	Shaft	Ext	Int	Optl	Inclined	36
Extra	Yes	Cone	4	Right	Double Reduc	7.6	Semi	Disk	Shaft	Ext	Int	Optl	Inclined	37
Extra	Yes	Cone	4	Right	Double Reduc	8.9	Semi	Disk	Shaft	Ext	Int	Optl	Inclined	38
Extra	Yes	Cone	4	Right	Double Reduc	8.9	Semi	Disk	Shaft	Ext	Int	Optl	Inclined	39
No	No	Cone	4	Right	Worm	6.75	Open	Star & Block	Shaft	Ext	Int	Cast	Vert	40
No	No	Cone	4	Right	Double Reduc	8.25	Open	Star & Block	Shaft	Ext	Int	Cast	Vert	41
No	No	Cone	4	Right	Double Reduc	8.25	Open	Star & Block	Shaft	Ext	Int	Cast	Vert	42
No	No	Cone	4	Central	Double Reduc	8.25	Open	Star & Block	Shaft	Ext	Int	Disk	Vert	43
Extra	Yes	Cone	4	Right	Worm	8	Enclosed	Star & Block	Shaft	Ext	Int	Cast	Vert	44
Extra	No	Multi Plate	4	Right	Worm	7.8	Enclosed	Star	Shaft	Ext	Int	Disk	Vert	45
No	No	Cone	3	Right	Chains	....		Fab. Disk	Shaft	Ext	Int	Cast	Inclined	46
No	No	Cone	3	Right	Chains	....		Fab. Disk	Shaft	Ext	Int	Cast	Inclined	47
Extra	No	Cone	4	Right	Worm	....	Open	Star & Block	Shaft	Ext	Int	Disk	Inclined	48
Extra	No	Cone	4	Right	Double Reduc	....	Open	Star & Block	Shaft	Ext	Int	Disk	Inclined	49
Extra	No	Cone	4	Right	Double Reduc	....	Open	Star & Block	Shaft	Ext	Int	Cast	Inclined	50
Extra	Yes	Plate	4	Right	Worm	7 or 8	Open	Star	Wheels	Int	Int	Cast	Inclined	51
Extra	Extra	Cone	4	Right	Worm	6	Open	Star & Block	Wheels	Int	Int	Cast	Vert	52
No	No	None	..		Worm	10.3	Open	Star & Block	Wheels	Int	Int	Cast	Vert	53
No	Yes	Cone	3	Right	Worm	7.25	Open	Fab. Disk	Shaft	Ext	Int	Disk	Vert	54
No	Yes	Cone	4	Right	Worm	7.25	Open	Fab. Disk	Shaft	Ext	Int	Disk	Vert	55
No	Yes	Cone	4	Right	Worm	8.25	Open	Fab. Disk	Shaft	Ext	Int	Disk	Vert	56
No	Yes	Cone	4	Right	Worm	10.3	Open	Fab. Disk	Shaft	Ext	Int	Disk	Vert	57
Extra	No	Cone	4	Central	Worm	6.2	Open	Star & Block	Shaft	Int	Int	Cast	Vert	58
Extra	Yes	Cone	3	Right	Worm	6.5	Open	Fab. Disk	Wheels	Int	Int	Cast	Vert	59
Extra	Yes	Cone	4	Right	Worm	8	Open	Fab. Disk	Wheels	Int	Int	Cast	Vert	60

ABBREVIATIONS: Flitch—Flitch Plate; **H. Shaft**—Hollow Shaft; (pressure); **As'td Thermo**—Assisted Thermo-syphon; **Semi**—Semi-enclosed; **Fab. Disk**—Fabric Disk; **Int**—Internal; **Ext**—External; **Vert**—Vertical.

Governor

Not fitted .....57 per cent
Fitted as standard .....40 per cent
Optional ..... 3 per cent

Clutches

Cone .....79 per cent
Single plate .....19 per cent
Multiple disk ..... 2 per cent

Gearset Location

All amidships except one model of one maker.

Gear Shift Lever

Right hand .....88 per cent
Central .....12 per cent

Universal Joints

Star and sliding block (pot joint) .....33 per cent
Fabric disk .....32 per cent
Star with plain bushes .....18 per cent
Star with ball bearings .....11 per cent
Disk and sliding block ..... 6 per cent

Propeller Shafts

Open* .....69 per cent
Semi-enclosed .....18 per cent
Enclosed .....13 per cent
*Including open shaft in chain drive.

Wheels

Hollow cast .....55 per cent
Disk .....21 per cent
Web cast .....15 per cent
Wood and miscellaneous..... 9 per cent

Brakes

Transmission and wheels.....77 per cent
Wheels only .....23 per cent
(No external wheel brakes.)

Final Drives

Worm .....52 per cent
Side chains .....23 per cent
Double reduction .....20 per cent
Bevel ..... 5 per cent
(No internal drive on wheels.)

Frames

Pressed steel .....77 per cent
Rolled channel .....16 per cent
Flitch plate ..... 7 per cent

Tendencies in British Truck Design in 1921

Only a few makers build trucks of less than 3000 lb. capacity. Steam trucks of 5-ton capacity hauling trailers and using either solid or liquid fuel compete with gasoline propelled trucks. Use of worm drive, pressed steel frame, and cast wheels increasing. Magneto ignition universal.

By M. W. Bourdon

THE manufacturers of British trucks are adopting a very conservative attitude on the subject of pneumatic tires for loads above 3500 lb. and not one of them is yet prepared to recommend either giant or twin pneumatics for bigger loads. Several are experimenting on their own transport vehicles, but are not yet inclined to advise buyers to discard solids. An exception must be made, however, of passenger-carrying vehicles—especially charabancs—with seating for from 18 to 32 passengers. In such cases pneumatics are advised, tentatively and with many reservations, it is true. But there is an inclination towards twin pneumatics for the rear wheels in place of giant singles, and the most favored make is the Michelin on the same firm's disk wheels. Goodyear is, nevertheless, pushing giants very hard and will no doubt make a gradual and an increasing impression on the potential market.

As might be gathered from what has been said, British truck makers are not yet making plans for a special chassis more suited to the use of pneumatics than the existing types. The great majority of firms spread themselves on trucks for 3 to 5 ton (say, 6700 lb. and 11,000 lb.) loads, comparatively few making smaller chassis and only isolated plants turning out vehicles for 30 cwt. and less.

Austin is the most prominent new-comer in the latter field with a chassis having the 20 h.p. engine and gearset unit designed originally for the post-war Austin passenger car. Of its size and type it is the cheapest British truck. There is no truck or light van made to compete with the Ford, for though a few firms have modified passenger car and taxicab chassis for light delivery service, their prices are far above that of the one-ton Ford.

The steam truck for loads of 5 tons on its own superstructure and 2 or 3 tons additional on a trailer is very popular among users for certain classes of work. It is not only, as it was at one time, confined to short journeys and dock and rail service, but several of the many transport companies which have sprung up all over the country since the war utilize this type of vehicle for runs up to 200 miles away from headquarters. It has a two-man control, for, clearly, stoking with solid fuel cannot be done by the driver. The majority are now fitted with solid rubber tires instead of the iron shod wheels which gave them a legal speed of only 5 m.p.h. and an economical speed of less than double that if the drivers cared to risk it. With rubber tires its legal speed is 8 m.p.h., but this is very frequently exceeded, speeds of 28 to 30 m.p.h. being maintained mile after mile on slightly falling gradients.

The internal combustion engined truck is, therefore, feeling the competition of the steamer more than previously, and the need for stops with the latter to replenish the water supply at least every 30 miles is, by many owners, considered compensated for by the lower cost of fuel consumed. Serious attempts are now being made to utilize liquid fuel for their burners, and although this shows approximately 20 per cent increase in cost at present as compared with coal, is offset by the greater convenience, time saved in filling up, and better average speed owing to the driver being able to maintain steam pressure more easily under varying conditions of running.

Reverting to gasoline trucks, with which the accompanying table deals exclusively, the most marked variations since the war are the wider use of pressed steel frame members in lieu of channel section rolled steel; the discarding of side chains for final drive in favor, as a rule, of the worm; the increasing use of the fabric disk type of universal joint; and the great popularity of the cast steel hollow spoke wheel. Disk wheels have not proved so durable as was originally anticipated; considerable trouble has been experienced with the loosening of rivets, and although Thornycroft, among the important makers, uses them exclusively, most of the other well-known firms are gradually dropping them. At present 55 per cent of British trucks have the cast hollow spoked type, 21 per cent disk (the latter including some of the light delivery vans), 15 per cent cast steel, solid spoked, and 9 per cent wood and miscellaneous.

The flitch plate frame still finds adherents in Daimler and A. E. C., though only in one model of the latter; 77 per cent of chassis have pressed steel side members and 16 per cent rolled steel channel. Of both pressed and rolled, 10 per cent have the channel facing outward, for with this arrangement, it is claimed, mounting of cross members, sub frames and main components is facilitated.

The T-head cylinder construction, which, before the war, was considerably favored, has been very largely discarded, and 71 per cent of engines now have L-heads. Nevertheless, one or two of the most prominent firms still arrange the valves on both sides, notably Dennis and Thornycroft, the latter in three models out of four. Seventy-seven per cent of cylinders are pair cast, but only 20 per cent have detachable heads. The 23 per cent of block cast cylinders all occur in chassis of a load capacity of 2 tons or under.

The following are average bores and strokes for British trucks of the load capacities given: 4500 lb., 3⅞ x 5½ in.; 6700 lb., 4¼ x 5½ in.; 9000 lb., 4⅝ x 5¾ in.; 11,000 lb., 4¾ x 6 in.

Frequently, however, makers whose range includes chassis with load capacity from 6700-11,000 lb., utilize the same size of engine for two or three models. For instance, Thornycroft uses a 4½ x 6 engine for three sizes,

(*Continued on page* 371)

Trend of Tractor Design as Revealed by Statistics for 1921 Models

Fewer manufacturers are making creeper type machines. Average piston displacement has decreased but is balanced by increase in piston speed. Fewer two-cylinder engines are used. Marked increase in the percentage of disk clutches. No material change in number of speeds.

By P. M. Heldt

IN order to get a concrete idea of trends in farm tractor design, we have analyzed the tractor specification tables for 1919, 1920 and 1921, and present the results herewith, in tabular form. Comparing the figures for 1921 with those for 1920, the first thing that stands out is a large decrease in the percentage of creeper type tractors. This, of course, is due to the fact that numbers of the creeper tractors listed last year were hardly beyond the experimental stage and never got onto a real production basis. Those firms in the creeper type tractor field which were really producing last year are still doing business. However, the enthusiasm with which the creeper type was taken up by newcomers in the industry last year has received something of a check.

In analyzing the specification sheets it was considered advisable in many cases to see how practice varied in the different capacity classes of tractors. In doing this a difficulty was introduced by the fact that quite a number of tractors now have a double rating, such as 2-3 plow or 3-4 plow. It was decided to use the lower rating for the purpose of this analysis and count the 2-3 plow tractors, for instance, with the 2-plow tractors.

There has been no material change in the distribution between the different classes of the tractors listed. The single plow class, which comprises the garden tractors, is slightly larger and the class of tractors for five or more plows slightly smaller; also the three-plow class does not predominate numerically to the same extent as last year, but on the whole the shifting from one capacity class to another has not been pronounced.

Average piston displacements in all classes have decreased, in the 2-plow class about 10 per cent, in the 3-plow class nearly the same, and in the 4-plow class about 8.5 per cent. No doubt this is largely balanced by an increase in piston speeds. The average piston speed of all four-cylinder engines without regard to plow capacity was found to have increased 2½ per cent.

The percentage of single-cylinder engines has increased, due to the fact that most of the garden tractors recently developed have that type of engine, but these engines are vertical and not exceptionally slow and heavy. The two-cylinder type shows a distinct loss, whereas each of the other three types used shows a gain. There is also a slight decline in the proportion of horizontal engines. On the whole the types of engine used remain very much the same.

There has been no change in the governor situation. A few makes have no governor. The hydraulic and electric types of governor are used on one make of tractor each, and all the rest of the tractors have centrifugal governors. The methods of cylinder casting remain substantially the same, though the block cast type shows a slight gain in popularity.

It was considered desirable to get a comparative figure for engine weight, and the average weights per cubic inch displacement and per belt horsepower. The average of all 1920 engines was found to be 2.69 lb. per cu. in. displacement. However, as the engines considered included some very small ones used on garden tractors, and also some very large ones used on the mammoth 30-60 and 40-80 hp. tractors, it was considered a more logical procedure to average the weights per cu. in. displacement for all engines between 250 and 500 cu. in. piston displacement, which includes practically all of the 2 and 3-plow and the majority of the modern 4-plow tractors. This average was found to be 2.64 lb. per cu. in. displacement, and therefore does not differ much from the general average. The average weight for all engines in respect to rated belt horsepower was found to be 39 lb., while that of engines between 250 and 500 cu. in. displacement was 37.1 lb.

Gravity fuel feed is very much in the lead in tractor practice. Pump feed is used in a number of tractors which have engines of a type similar to those used in stationary practice. The sponsors of vacuum feed have secured a foothold in the tractor industry but little more. The proportions are substantially the same as last year.

Practice in clutches has changed materially. Unfortunately, many concerns in filling out the specification blank do not give the type of clutch, and this leaves the percentage values obtained somewhat uncertain. Disk clutches, which constituted only 48 per cent of the whole in 1920, represented 60 per cent of the total in 1921. This is easily explained, as practically all stock clutches for tractors are of the disk or plate type. The chief competing type is the shoe clutch, which is used mainly by firms which entered the tractor business from the implement industry and manufacture their own clutches. This type of clutch is comparatively bulky and does not lend itself well to enclosure, so the clutches on the newer designs of completely enclosed tractors are practically all of the disk or plate type, the few exceptions being cone clutches.

There has been no great change in respect to the number of gear speeds provided. Slight gains are shown for the two and three-speed tractors and equivalent losses by the single and multi-speed machines. There appeared to be quite a strong tendency in the course of the year to go to three-speeds for three and four-plow tractors, but the figures now available do not bear out this impression. While the three-speed machine has gained somewhat, its gain is no greater than that of the two-speed.

Belt speeds average very close to the standard of 2600

Specifications of American

Name and Model	Price	Plow Capacity	H.P. Rating	Engine Make	No. of Cylinders Bore & Stroke	Engine Type	Cylinders Cast	R.P.M.	Make of Governor	Type of Governor	Engine Weight	Lubrication System	Mechanical Lubricator Make	Oil Pump Type	Ignition System	Impulse Starter	Carbureter Make	Water Injected with Fuel	Fuel Feed	Fuel Tanks and Capacities	Air Cleaner Make
Allis-Chalmers....6-12	.....	1	6-12	Le Roi...	4-3½x4½	L..	Block.	1000	Own.....	Cent....	360	Sp-Pr..	.....	Plunger..	Eisemann..	No..	Kingston..	No..	Grv...	8½G.....	Toro.....
Allis-Chalmers....18-30	.....	4	18-30	Own.....	4-4¾x6½	I...	Block.	850	Own.....	Cent....	1600	Pressure.	.....	Gear....	Eisemann..	Yes.	Kingston..	Yes.	Grv...	7½G-22½K.	Toro.....
Allwork.....C	.....	3	14-28	Own.....	4-5 x6	L..	Singly.	900	Own.....	Cent....	1200	Circ-Sp..	.....	Plunger..	Magneto..	Yes.	Kingston..	No..	Grv...	5G-25K.....	Bennett...
Allwork.....G	.....	3	14-28	Own.....	4-4¾x6	L..	Singly.	900	Own.....	Cent....	1170	Circ-Sp..	.....	Plunger..	Magneto..	.....	Kingston..	No..	Grv...	5G-25K.....	Bennett...
Andrews Kinkade.....D	$2,500	4	18-36	Climax...	4-5 x6½	L..	Pairs..	900	Climax...	Cent....	1100	Pressure.	.....	Vane....	Splitdorf...	Yes.	Stromberg.	Yes.	Grv...	5G-20K.....	Spirex...
Ano.....A	....	....	3-5	Own.....	1-4½x5	L..	Singly.	800	None.....	.....	.....	Splash...	.....	.....	Magneto..	Yes.	Schebler...	No..	Grv...	2G.....	.....
Appleton.....12-20	1,650	3	12-30	Buda.....	4-4¼x5½	L..	Block.	1000	Pickering.	Cent....	750	Pressure.	.....	Gear....	Bosch.....	.....	Schebler...	Yes.	Grv...	G-K.....	Bennett...
Aultman-Taylor...30-60	.....	8	30-60	Own.....	4-7 x9	I...	Pairs..	500	Own.....	Cent....	.....	Pressure.	Detroit..	.....	Eisemann..	No..	Kingston..	Yes.	Grv...	20G-60K....	.....
Aultman-Taylor...22-45	.....	6	22-45	Own.....	4-5½x8	I...	Pairs..	600	Own.....	Cent....	.....	Pressure.	Detroit..	.....	Eisemann..	No..	Kingston..	Yes.	Grv...	20G-35K....	.....
Aultman-Taylor...15-30	.....	4	15-30	Climax...	4-5 x6½	L..	Pairs..	800	Climax...	Cent....	.....	Circ.....	.....	Vane....	Eisemann..	Yes.	Kingston..	No..	Grv...	6G-16K.....	Bennett...
Automotive.....B-3	1,785	3	12-24	Hercules.	4-4 x5⅛	L..	Block.	1000	Pierce....	Cent....	850	Pressure.	.....	Gear....	Eisemann..	Yes.	Kingston..	No..	Yes...	18G.....	Bennett...
Avery Cultivator.....C	.....	....	....	Own.....	6-3 x4	L..	Block.	1250	Own.....	Throt....	470	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	No..	Grv...	10G.....	Bennett...
Avery...Single Row Colt	.....	....	5-10	Own.....	4-3 x4	L..	Block.	1250	Own.....	Throt....	300	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	No..	Grv...	10G.....	Bennett...
Avery.....B	.....	2	5-10	Own.....	4-3 x4	L..	Block.	1250	Own.....	Throt....	300	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	No..	Grv...	11G.....	Bennett...
Avery.....C	.....	....	....	Own.....	6-3 x4	L..	Block.	1250	Own.....	Throt....	470	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	No..	Grv...	10G.....	Bennett...
Avery.....12-25	.....	4	12-25	Own.....	2-6½x7	I...	Singly.	600	Own.....	Throt....	1350	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	6¾G-14K...	Bennett...
Avery.....14-28	.....	4	14-28	Own.....	4-4½x7	I...	Block.	700	Own.....	Throt....	1620	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	3¼G-20K...	Bennett...
Avery.....18-36	.....	5	18-36	Own.....	4-5½x6	I...	Block.	650	Own.....	Throt....	2150	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	6G-27K....	Bennett...
Avery.....25-50	.....	6	25-50	Own.....	4-6½x7	I...	Block.	600	Own.....	Throt....	2200	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	6G-27K....	Bennett...
Avery.....45-65	.....	10	45-65	Own.....	4-7¾x8	I...	Block.	600	Own.....	Throt....	3300	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	6¾G-44K...	Bennett...
Avery.....8-16	.....	2-3	8-16	Own.....	2-5½x6	I...	Singly.	600	Own.....	Throt....	925	Circ-Sp..	.....	Gear....	K-W.....	Yes.	Kingston..	Yes.	Grv...	2G-12K....	Bennett...
Bates.....D	.....	3	15-25	Own.....	4-4¼x6	I...	Block.	900	Own.....	Cent....	1000	Pressure.	.....	Gear....	Splitdorf...	Yes.	Own.....	Yes.	Grv...	1G-15K.....	Own.....
Beeman.....G	340	½	2-4	Own.....	1-3½x4½	L..	Single.	800	None.....	.....	600	Splash...	.....	.....	Heinze....	No..	J & L.....	Yes.	Grv...	1¼G.....	Donaldson.
Best.....Thirty	3,250	4	20-30	Own.....	4-4¾x6½	I...	Singly.	800	Own.....	Cent....	1600	Circ-Sp..	.....	Gear....	Berling....	Yes.	Ensign....	Yes.	Vac...	40G.....	Pomona...
Best.....Sixty	5,750	10	35-60	Own.....	4-6½x8	I...	Singly.	950	Own.....	Cent....	3150	Circ-Sp..	.....	Gear ..	Bosch.....	Yes.	Ensign....	No..	Vac...	65G.....	Pomona...
Case.....10-18	.....	2	10-18	Own.....	4-3⅞x5	I...	Block.	1050	Own.....	.....	.....	Circ-Sp..	.....	Plunger..	.....	Yes.	Kingston..	No..	Grv...	2G-10½K...	Own.....
Case.....15-27	.....	3	15-27	Own.....	4-4½x6	I...	Block.	900	Own.....	.....	.....	Circ-Sp..	.....	Plunger..	.....	Yes.	Kingston..	No..	Grv...	2¾G-20K...	Own.....
Case.....22-40	.....	5	22-40	Own.....	4-5½x6¾	I...	Pairs..	....	Own.....	.....	.....	Non-Circ	Detroit..	.....	Bosch..	Yes.	Kingston..	Yes.	Grv...	3¾G-26½...	Own.....
Caterpillar.....T-11	.....	4	25-	Own.....	4-4¾x6	I...	Pairs..	1050	Own.....	Cent....	1100	Pressure.	.....	Gear ..	Eisemann..	Yes.	Schebler...	No..	Vac...	46G.....	Donaldson.
Caterpillar.....T-16	.....	6	40-	Own.....	4-6½x7	I...	Singly.	700	Own.....	Cent ..	2300	Pressure.	.....	Gear ..	K-W.....	Yes.	Kingston..	No..	Vac...	46G.....	Donaldson.
Chase.....12-25	.....	2	12-25	Buda.....	4-4¼x5½	L..	Block.	1000	Pierce....	Cent....	800	Pressure.	.....	Gear....	Splitdorf...	Yes.	Kingston..	No..	Grv...	2G-15K....	R. & W...
Cletrac.....W	.....	3	12-20	Own.....	4-4 x5½	I...	Block.	1265	Own.....	Cent....	650	Circ-Sp..	.....	Gear....	Teagle....	Yes.	Kingston..	No..	Grv...	¾G-13K....	Own.....
Dakota.....4	1,750	3	15-27	Doman...	4-4¾x6	T...	Pairs..	800	Doman...	Cent....	900	Circ-Sp..	.....	Gear....	K-W.....	Yes.	.....	No..	Vac...	18G.....	Johnson...
DePue.....20-30	2,500	4	20-30	Buda.....	4-4½x6	.....	.....	800	.....	Cent....	925	Pressure.	.....	Gear....	Bosch	Yes.	Stromberg.	No..	Grv...	14G.....	Cyclone...
Dill.....D	2,480	3	20	Cont.....	4-4½x5½	L..	Pairs..	1000	Pierce....	Cent....	.....	Splash...	.....	Plunger..	Bosch.....	No..	Kingston..	No..	Grv...	15G.....	Donaldson.
Do-It-All.....	595	5-7	4-6	Own.....	1-4½x5	I...	Singly.	1000	.....	.....	.....	Splash...	.....	.....	Berling....	.....	Holly.....	No..	Grv...	.....	Donaldson.
Eagle.....F	1,390	3-4	12-22	Own.....	2-7 x8	I...	Pairs..	425	Own.....	Cent....	2200	Pressure.	M-K.....	.....	Splitdorf...	Yes.	Schebler...	Yes.	Grv...	4G-12K....	Own.....
Eagle.....F	1,850	4-5	16-30	Own.....	2-8 x8	I...	Pairs..	425	Own.....	Cent....	2750	Pressure.	M-K.....	.....	Splitdorf...	Yes.	Schebler...	Yes.	Grv...	5G-18K....	Own.....
Emerson-Brantingham 12-20	.....	3	12-20	Own.....	4-4¾x5	L..	Pairs..	900	Own.....	Cent....	1000	Splash...	.....	Plunger..	K-W.....	Yes.	Stromberg.	Yes.	Grv...	4G-20K....	Bennett...
Fageol.....D	1,525	2	9-12	Lycom....	4-3½x5	L..	Block.	1200	None.....	.....	470	Circ-Sp..	.....	Plunger..	Splitdorf...	Yes.	Tillotson..	No..	Grv...	12G.....	Own.....
Farm Horse.....“B”	1,885	3	18-30	Climax...	4-5 x6½	L..	Pairs..	800	.....	.....	.....	.....	.....	.....	Splitdorf...	Yes.	Bennett...	Yes.	Grv...	5G-18K....	.....
Farquhar.....15-25	.....	3	15-25	Buda.....	4-4½x6	L..	Block.	900	Pierce....	Cent....	1100	Circ.....	.....	Gear....	K-W.....	Yes.	Kingston..	No..	Grv...	5G-25K....	R. W.....
Farquhar.....25-50	.....	6	25-50	Own.....	4-7 x8	I...	Pairs..	550	Own.....	Throt....	2500	Circ-Sp..	Detroit..	.....	K-W.....	Yes.	Kingston..	No..	Grv...	30G-30K....	.....
Farquhar.....18-35	.....	4	18-35	Own.....	4-6 x8	I...	Pairs..	550	Own.....	Throt....	2000	Circ-Sp..	Detroit..	.....	K-W.....	Yes.	Kingston..	No..	Grv...	30G-30K....	.....
Fitch.....	.....	3	20-35	Climax...	4-5 x6½	L..	Pairs..	800	Climax...	Cent ..	1200	Pressure.	.....	Special..	Climax ..	Yes.	Ensign....	No..	Grv...	2G-28K....	Bennett...
Fordson.....	790	2	-18	Own.....	4-4 x5	L..	Block.	1000	.....	.....	760	Circ.....	.....	F. Wheel	Own.....	No..	Holley....	Yes.	Grv...	1G-21K....	Own.....
Franklin.....G	3,650	3-4	18-30	Climax...	4-5 x6½	L..	Pairs..	800	Climax...	Cent....	1250	Pressure.	.....	Vane....	Eisemann..	Yes.	Zenith....	No..	Grv...	17G-3K....	Donaldson
Frick.....C	.....	3	15-28	Beaver...	4-4¾x6	I...	Block.	900	Taco.....	Cent ..	1000	Circ-Sp..	.....	Gear....	Splitdorf...	Yes.	Bennett...	No..	Grv...	3G-17K....	Bennett...
Frick.....A	.....	2	12-20	Erd.....	4-4 x6	I...	Block.	900	Erd.....	Cent....	775	Circ-Sp..	.....	Plunger..	Kingston..	Yes.	Kingston..	No..	Grv...	3G-20K....	Bennett...
G-O.....G	1,485	3	14-28	Waukesha	4-4½x5¾	L..	Pairs..	1000	Waukesha	Cent....	750	Circ-Sp..	.....	Gear....	Eisemann..	Yes.	Kingston..	Yes.	Grv...	12G-24K....	Bennett...
Gray.....	.....	....	18-36	Waukesha	4-4¾x6¾	L..	Pairs..	850	Waukesha	Cent....	875	Circ-Sp..	.....	Gear....	Bosch.....	Yes.	Bennett...	Yes.	Grv...	34G.....	Bennett...
Ground Hog.....	.....	3	19-31	Erd.....	4-4 x6	I...	.....	850	.....	.....	.....	.....	.....	.....	Splitdorf...	.....	Schebler...	.....	.....	.....	Amt. Co...
Hart Parr.....30	1,595	4	15-30	Own.....	2-6½x7	I...	Block.	750	Own.....	Cent....	1190	Pressure.	M-K.....	.....	K-W.....	Yes.	Schebler...	Yes.	Grv...	1G-23K....	Own.....
Hesder.....C	.....	3	12-20	Waukesha	4-4½x6¾	L..	Pairs..	900	Waukesha	Cent....	780	Circ-Sp..	.....	Gear....	Splitdorf...	Yes.	Kingston..	Yes.	Grv...	7G-14K....	Bennett...
Hesder.....D	.....	2	9-16	Waukesha	4-4¼x5¾	L..	Pairs..	1000	Waukesha	Cent....	670	Circ-Sp..	.....	Gear....	Splitdorf...	Yes.	Kingston..	Yes.	Grv...	7G-14K....	Bennett...
Huber.....Super 4	.....	3	15-30	Midwest..	4-4½x6	I...	Pairs..	1100	Pierce....	Cent....	.....	Pressure.	.....	Gear....	Kingston..	Yes.	Kingston..	No..	Grv...	23G.....	R-W.....
Huber.....Light 4	.....	3	12-25	Waukesha	4-4½x5¾	L..	Pairs..	1000	Waukesha	Cent....	711	Circ-Sp..	.....	Gear....	Kingston..	Yes.	Kingston..	Yes.	Grv...	2G-20K....	Bennett...
Imperial.....E	5,000	10	40-70	Own.....	4-7½x9	I...	Singly.	400	Own.....	Cent....	.....	Pressure.	Detroit..	.....	Splitdorf...	Yes.	Kingston..	Yes.	Pump.	70G.....	Bennett...
Indiana.....F	.....	1	5-10	Le Roi...	4-3½x4½	L..	Block.	1000	Le Roi...	Cent....	350	Splash...	.....	Plunger..	.....	No..	Kingston..	No..	Grv...	10G.....	Bennett...
International.....8-16	1,150	2	8-16	Own.....	4-4¼x5	I...	Block.	1000	Own.....	Cent....	960	Sp-Pres..	.....	Plunger..	Splitdorf...	Yes.	Ensign....	No..	Grv...	1G-11½K...	Own.....
International.....15-30	2,300	4	15-30	Own.....	4-5¼x8	I...	Pairs..	575	Own.....	Cent....	2265	Pressure.	M-K.....	.....	K-W.....	Yes.	Own.....	Yes.	Pump.	24K.....	Own.....
J-T.....N	.....	....	16-30	.....	4-4¾x6	I...	Block.	900	.....	Cent....	.....	Circ-Pr..	.....	Gear....	K-W.....	....	Own.....	No..	Grv...	2½G-26½K.	Bennett...
La Crosse.....M	900	1	6-12	Own.....	2-4 x6	I...	Block.	1000	Own.....	Cent....	600	Pressure.	M-K.....	.....	At-Kent..	No..	Kingston..	No..	Grv...	2G-13K....	Bennett...
La Crosse.....H	1,250	3	12-24	Own.....	2-6 x7	I...	Block.	900	Own.....	Cent....	900	Pressure.	M-K.....	.....	Splitdorf...	Yes.	Kingston..	Yes.	Grv...	2G-13K....	Bennett...
Lauson.....15-30	.....	3	15-30	Beaver...	4-4¾x6	I...	Block.	950	Taco.....	Cent....	1200	Pressure.	.....	Gear....	Splitdorf...	Yes.	Kingston..	No..	Grv...	27G.....	Own.....
Leonard.....E	.....	3	20-30	Buda.....	4-4½x6	L..	Block.	1000	Simplex....	Cent....	960	Pressure.	.....	Gear....	Splitdorf...	Yes.	Zenith....	No..	Vac...	.....	Own.....
Liberty.....A	2,475	4	18-32	Climax...	4-5 x6½	L..	Pairs..	850	Own.....	Cent....	1150	Pressure.	.....	Vane....	Splitdorf...	Yes.	Stromberg.	Yes.	Grv...	5G-20K....	Bennett...
Lombard.....	.....	16	140	Special...	6-5½x6¾	T...	.....	1200	Special...	.....	.....	Pressure.	.....	Gear....	.....	Yes.	.....	.....	.....	65G.....	.....
Macultivator.....	225	....	1½	Own.....	1-2¾x3½	L..	....	1000	.....	.....	.....	Splash...	.....	.....	Berling....	No..	Schebler...	.....	Grv...	1G.....	.....
Magnet.....14-28	1,875	3	14-28	Waukesha	4-4½x6¼	L..	Pairs..	900	Waukesha	Cent....	950	Sp-Pr....	.....	Gear....	Berling....	Yes.	Stromberg.	.....	Grv...	5G-20K....	Bennett...
Merry Garden.....	230	....	2	Evinrude.	1-2⅝x2½	.....	Singly.	900	.....	.....	.....	Circ.....	.....	.....	Bosch.....	.....	Evinrude..	.....	Grv...	1½G.....	Atma.....
Mohawk.....	785	2	9-16	Light....	4-3¼x4½	L..	Block.	1000	Pierce....	Cent....	355	Splash...	.....	Plunger..	Simms....	No..	Kingston..	.....	.....	2G-6K....	Bennett...
Moline-Universal.....	1,325	2	9-18	Own.....	4-3½x5	T..	Block.	1400	Remy....	Electric..	730	Pressure.	.....	Gear....	.....	.....	Holley....	No..	Grv...	15G.....	Bennett...
New Britain.....1	.....	1	3-6	Own.....	2-2¾x4	L..	Block.	1500	None.....	.....	.....	Splash...	.....	.....	Splitdorf...	No..	Kingston..	No..	Grv...	2G.....	Bennett...
New Britain.....2	.....	1	3-6	Own.....	2-2¾x4	L..	Block.	1500	.....	.....	.....	Splash...	.....	.....	Splitdorf...	.....	Kingston..	No..	Grv...	2G.....	Bennett...
Nilson, Senior.....H	.....	4	20-40	Waukesha	4-5 x6¼	L..	Pairs..	900	Waukesha	Cent....	900	Sp-Pr....	.....	Gear....	Bosch.....	Yes.	Stromberg.	No..	Grv...	28K.....	Bennett...
Oil-Pull.....12-20	.....	3	12-20	Own.....	2-6 x8	I...	Pairs..	560	Own.....	Cent....	.....	Splash...	M-K.....	.....	Bosch.....	Yes.	Own.....	Yes.	Pump.	1G-23K....	Donald on.
Oil-Pull.....16-30	.....	4	16-30	Own.....	2-7 x8½	I...	Pairs..	530	Own.....	Cent....	2000	Splash...	M-K.....	.....	Bosch.....	Yes.	Own.....	Yes.	Pump.	1G-31K....	Donaldson.
Oil-Pull.....20-40	.....	6	20-40	Own.....	2-8 x10	I...	Singly.	450	Own.....	Cent....	.....	Splash...	M-K.....	.....	Bosch.....	Yes.	Own.....	Yes.	Pump.	1G-45K....	Donaldson.
Oil-Pull.....30-60	.....	8	30-60	Own.....	2-10 x12	I...	Singly.	375	Own.....	Cent....	7500	Splash...	M-K.....	.....	Bosch.....	Yes.	Own.....	Yes.	Pump.	3G-70K....	.....
Oldsmar.....	395	½	3-5	Own.....	1-5⅛x5½	I...	Singly.	585	Own.....	Cent....	350	Splash...	.....	.....	Splitdorf...	Yes.	Schebler...	Yes.	Grv...	2G.....	.....
Oliver.....A	.....	3	15-30	Beaver...	4-4½x6	I...	Block.	900	.....	Cent....	1000	Pressure.	.....	Gear....	Splitdorf...	Yes.	Bennett...	No..	Grv...	5G-15K....	Bennett...
Parrett.....K	.....	3	15-30	Pitt.....	4-4½x6	I...	Block.	1000	Own.....	Cent....	961	Pressure.	.....	Gear....	Eisemann..	Yes.	Kingston..	No..	Grv...	2¾G-18K...	Own.....

ABBREVIATIONS—Cent—Centrifugal; **Circ**—Circulating; **Circ-Pr**—Circulating Pressure; **Circ-Sp**—Circulating Splash; **Cont**—Contracting; **Elec**—Electric; **Expand**—Expanding; **Fric**—Friction; **Grv**—Gravity; **H**—Horizontal; **Hyd**—Hydraulic; **Ind**—Individual; **L**—L-Head;

Farm Tractors for 1921

Radiator Make	Cooling System Capacity	Cooling Fluid	Fluid Circulation	Belt Pulley Diameter, Face and R.P.M.	Gearset Make	Clutch Make	Clutch Type	No. of Forward Speeds	Differential Lock	Final Drive	Plowing Speed	No. of Driving Wheels	Diameter and Face	No. of Tracks	Drive Wheel Axle Type	No. of Non-drive Wheels	Steering Arrangement	Frame Material	Wheelbase	Total Weight	Name and Model
Own	3½	Water	Ther	10 x 5½-1000	Own	Borg & Beck	Plate	..	No	Rim	....	2	48 x6	..	Dead	2	Swinging	None	81	2500	Allis-Chalmers 6-12
Own	10	Water	Pump	15 x 7½- 830	Own	Own	Shoe	2	No	Spokes	2.3	2	50 x12	..	Revolving	2	Knuckle	None	95	6000	Allis-Chalmers 18-30
Perfex	12	Water	Pump	13½x 7 - 900	Own	Own	Disc	3	No	Rim	2¾	2	48 x12	..	Revolving	2	Knuckle	Struct	80	5200	Allwork C
Perfex	10	Water	Pump	11 x 6 - 900	Own	Own	Disc	3	Yes	Spokes	2½	2	42 x12	..	Revolving	2	Knuckle	Struct	74	4800	Allwork G
Spirex	12	Water	Pump	8 x14 - 900	Own	Own	Disc	2	No	Spokes	2.5	2	54 x14	..	Dead	2	Knuckle	Steel	96	4950	Andrews Kinkade D
	2	Water	Ther	6 x 4½- 800	Own	Own	Shoe	1		Axle		2		..	Live	2					Ano A
Perfex	8	Water	Pump	12 x 7½- 800	Nuttall	Borg & Beck	Plate	2		Gear	2¾	2	54 x12	..	Live		Knuckle	Steel		4900	Appleton 12-20
Own	12	Water	Pump	24 x11 - 500	Own	Own		2	No	Rim	2½	2	90 x24	..	Live	2	Swinging	Struct	136	25000	Aultman-Taylor 30-60
Own	85	Water	Pump	20 x10 - 600	Own	Own		3	No	Rim	2 1/10	2	70 x20	..	Live	2	Swinging	Struct	102	12800	Aultman-Taylor 22-45
Hooven	5	Water	Pump	20 x 8 - 400	Own	Own	Shoe	3	No	Rim	2 1/10	2	70 x12	..	Live	2	Knuckle	Struct	98½	7800	Aultman-Taylor 15-30
McC.-T	7½	Water	Pump	10 x 8 -1000	Own	Borg & Beck	Plate	2	Yes	Axle	2¾	2	40 x10	..	Live	2	Power	Steel	70	3950	Automotive B-3
Own	6¾	Water	Ther	10 x 5¼ - 800	Own	Own	Disc	3	No	Spokes	2½	2	42 x6	..	Dead	1	Caster	Channel	106	3450	Avery-Cultivator C
Own	4½	Water	Ther	10 x 5¼ - 800	Own	Own	Disc	3	No	Spokes	2½	2	42 x5	..	Dead	2	Swinging	Channel	81	2650	Avery Single Row Cult
Own	4½	Water	Ther	12 x 5¼ - 800	Own	Own	Disc	3	No	Spokes	2½	2	38 x10	..	Dead	2	Knuckle	Channel	78	2600	Avery B
Own	4½	Water	Ther	10 x 5¼ - 800	Own	Own	Disc	3	No	Spokes	2¼	2	38 x10	..	Dead	2	Knuckle	Channel	90	3150	Avery C
Own	17½	Water	Ther	19½x 7 - 700	Own	Own	Shoe	2	No	Spokes	2⅛	2	56 x20	..	Revolving	2	Swinging	Channel	95	7500	Avery 12-25
Own	30	Water	Ther	16 x 7 - 700	Own	Own	Disc	2	No	Spokes	2¼	2	60 x16	..	Revolving	2	Swinging	Channel	96	6800	Avery 14-28
Own	33	Water	Ther	18 x 8 - 650	Own	Own	Disc	2	No	Spokes	2	2	65 x20	..	Revolving	2	Swinging	Channel	97	9250	Avery 18-36
Own	55	Water	Ther	22 x 8½- 600	Own	Own	Disc	2	No	Spokes	2½	2	69 x20	..	Revolving	2	Swinging	Channel	114	12500	Avery 25-50
Own	90	Water	Ther	26 x10 - 500	Own	Own	Disc	2	No	Spokes	1¾	2	87½x24	..	Revolving	2	Swinging	Channel	138	22000	Avery 45-65
Own	12½	Water	Ther	18 x 7 - 600	Own	Own	Shoe	2	No	Spokes	1¾	2	50 x12	..	Revolving	2	Swinging	Channel	90	4900	Avery 8-16
Own	8	Water	Pump	10 x 7 - 850	Own	Own	Shoe	3	Yes	Rim	2½	2	50 x12	..	Dead	2	Knuckle	I-Beam	74	4000	Bates D
Shotwell	1½	Water	Ther	4½x 3½		Own	Cone					2	25½x 3¼	..		2				600	Beeman G
Own	9	Water	Ther	12 x 7	Own	Own	Disc	2		Gear	2			2			Power	None		2500	Best Thirty
Own	20	Water		16 x10	Own	Own	Disc	2		Gear	1⅞			2			Power	Struct		17500	Best Sixty
Own	9	Water	Pump	14¼x 5¼-1050	Own	Own	Shoe	2	Yes	Spokes	2¼	2	42 x9	..	Live	2	Knuckle	Cast	65	3400	Case 10-18
Own	11	Water	Pump	16 x 6½- 900	Own	Borg & Beck	Plate	2	Yes	Spokes	2¼	2	52 x14	..	Live	2	Knuckle	Cast	76½	6350	Case 15-27
Own	15½	Water	Pump	16½x 8½	Own	Own	Shoe	2	Yes	Spokes	2½	2	56 x16	..	Live	2	Knuckle	Struct	96	9200	Case 22-40
Modine	7½	Water	Pump	10½x 8½-1012	Own	Own	Disc	3		Gear	1 6/10			2			Clutches	Cast		9400	Caterpillar T-11
Own	12	Water	Pump	10½x10½- 850	Own	Own	Disc	3		Gear	1 8/10			2			Clutches	Cast		19000	Caterpillar T-16
Perfex	6	Water	Pump	10 x 8 -1000	Own	Bierman	Shoe	2		Rim	1¾	2	48 x12	..	Dead	1	Knuckle	Struct	94	5200	Chase 12-25
McCord	5	Water	Pump	8 x 6 -1265	Own	Borg & Beck	Plate	1	No	Gear	3½			2	Dead	8	Special	Struct		3455	Cletrac W
J-T	12	Water	Pump	14 x 7 - 800	Own		Shoe	2	No	Axle	3	1	42 x 6	..	Live	2	Knuckle	Struct	108	5700	Dakota 4
Perfex	8	Water	Pump	8 x10 - 385	Own	Borg & Beck	Plate	3	No		1½	4	40 x10	..	Live		Swinging	Struct	100	6500	Depue 28-30
Eureka	10	Water	Pump	x 1½		Borg & Beck	Plate	3	No	Chain	2½	2	42 x 3	..			Knuckle	Struct	144	4800	Dill D
Own	5	Water	Ther	6 x 4										..							Do-It-All
Perfex	12	Water	Pump	20 x10 - 425	Own	Own	Spur	2	No	Rim		2	48 x12	..	Dead	2	Knuckle	Struct	87	5850	Eagle F
Perfex	15	Water	Pump	20 x10 - 425	Own	Own	Spur	2	No	Rim		2	52 x12	..	Revolving	2	Knuckle	Struct	88	7100	Eagle F
Modine	7½	Water	Pump	12 x 6½- 900	Own	Own	Cone	2	No	Gear	2 7/10	2	54 x12	..	Revolving	2	Knuckle	Channel	87½	4355	Emerson-Brantingham 12-20
Modine		Water	Pump	6 x 6½-	Own	Own	Shoe	1		Axle	1¾	2	48 x 8	..	Live	2	Knuckle	Struct	77	3500	Fageol D
Shotwell	9	Water	Ther	14 x 9 - 800	Own		Disc	2	No	Spokes	3½	2	52 x26	..	Dead	2	Knuckle	Channel	80	5200	Farm Horse
Modine	10	Water	Pump	14 x 7 - 800	Nuttall	Borg & Beck	Plate	2	No	Rim	2¼	2	54 x10	..	Dead	2	Knuckle	Channel	83	5800	Farquhar 15-25
Own		Water	Pump	32 x 9 - 275	Own	Own	Fric	1	Yes	Rim	2 9/10	2	84 x20	..	Dead	2	Swinging	Channel	132	19000	Farquhar 25-50
Own		Water	Pump	32 x 9 - 275	Own	Own	Fric	1	Yes	Rim	2 9/10	2	84 x20	..	Dead	2	Swinging	Channel	132	16000	Farquhar 18-35
Spirex	7	Water	Pump	14 x 8 - 700	Ganshaw	Cotta	Special	3	No	Axle	2¼	4	36 x12	..	Live		Swinging	Channel		5800	Fitch
Own	12	Water	Ther	9½x 6½-1000	Own	Own	Disk	3	No	Axle	2 7/10	2	42 x12	..	Live	2	Knuckle		63	2325	Fordson
Modine	8	Water	Pump	12 x 8 - 132		Own		3		Chain	2¾		198 x12	2	Revolving		Clutch	Struct	60	9250	Franklin G
Perfex	9¾	Water	Pump	13 x 7 - 900	Nuttall	Own	Shoe	2	No	Rim	2 9/10	2	60 x12	..	Revolving	2	Knuckle	Struct	69¾	6450	Frick C
Perfex	7¾	Water	Pump	13 x 7 - 900		Own	Shoe	2	No	Rim	2 9/10	2	60 x10	..	Revolving	2	Knuckle	Struct	67¾	5700	Frick A
Perfex	6	Water	Pump	10 x 6 - 900	Own	Own	Fric	6	Yes	Rim	2¾	2	46 x12	..	Revolving	2	Knuckle	Struct	85	4200	G-O G
Shotwell	9	Water	Pump	11½x 8½- 850	Own	Own	Cone			Rim	2½	1	54 x54	..	Revolving	2	Knuckle	Struct	104	6185	Gray
A.M.T				14 x 7		Twin								..					90	3750	Ground-Hog
Perfex	10	Water	Pump	14 x 8 -2300	Own	Own	Shoe	2	No	Gear	3	2	52 x10	..	Revolving	2	Knuckle	Steel	132	5200	Hart-Parr 30
Perfex	9⅝	Water	Pump	14 x 7			Fric	4	No	Rim	2½	2	57 x10	..	Live	2	Knuckle	Steel	96	6000	Heider C
Perfex	8	Water	Pump	12 x 6 -1600			Fric	4	No	Rim	2½	2	54 x8	..	Live	2	Knuckle	Steel	90	4000	Heider D
Perfex	10	Water	Pump	13 x 8 -1100	Own	Own	Disc	2	No	Rim	2 9/10	2	60 x10	..	Revolving	2	Knuckle	Struct	90	6200	Huber-Super 4
Perfex	8	Water	Pump	13 x 7 -1000	Own	Own	Shoe	2	No	Rim	2 7/10	2	60 x10	..	Revolving	2	Knuckle	Struct	90	5300	Huber-Light 4
Own	45	Water	Pump	30 x12 - 400	Own	Own	Shoe	2	Yes	Rim	2½	2	96 x30	..	Dead	2	Swinging	Steel	137	20800	Imperial E
Chandler	4½	Water	Ther	14 x 1¼	Own	Own	C. B	4	No	Chain	2½	2	50 x12	..	Dead	2	Swinging	C. I	64	2300	Indiana F
B. & L	12	Water	Ther	12¼x 8½- 625	Own	Own	Disc	2	No	Spokes	2¾	2	40 x10	..	Dead	2	Knuckle	Struct	85	3600	International 8-16
B. & L	40	Water	P.&T	18 x 9 - 575	Own	Own	Cont	2	No	Spokes	2¾	2	66 x14	..	Live	2	Knuckle	Struct	94	8990	International 15-30
McCord	6½	Water	Pump	10 x 8 - 900	Covert	Covert	Disc	3	No	Rim	2½		242 x11	2				Struct	74		J-T N
Modine	14	Water	Pump	10 x 5½-1000	Own	Own	Fric	1	Yes	Rim	3	2	48 x7	..	Dead	2	Knuckle	Channel	72	2800	La Crosse M
Modine	8	Water	Pump	11 x 7½- 900	Own	Own	Cont	1	Yes	Rim	3	2	56 x10	..	Revolving	2	Knuckle	Steel	90	3800	La Crosse H
Perfex	7½	Water	Pump	17½x 8 - 475	Own	Own	Shoe	2	No	Rim	2½	2	54 x12	..	Revolving	2	Knuckle	Struct	88	6550	Lausen 15-30
Modine	8	Water	Pump	16 x 8 - 575	Own	Hilliard		2	Yes	Gear	2¾	4	50 x12	..	Stationary		Swinging	Steel	98	5000	Leonard E
S. & J	10	Water	Pump	12 x 8 - 950	Own	Own	Shoe	2	No	Axle	2½	2	48 x12	..	Live	2	Knuckle	Channel	84	6000	Liberty A
Special						Special		3		Axle	2			2			Knuckle				Lombard
										Spokes		2	19½x3	..	Dead					210	Macultivator
S. & J	10	Water	Pump	14 x 7 - 700	Own	Borg & Beck	Plate	3	No	Axle	2½	2	48 x12	..	Live	2	K. & Sw	Channel	90	4400	Magnet 14-28
	2	Water	Ther	6 x 2 - 200	Own	Own	Dog	1		Spokes		2	20 x3	..	Live			Iron		260	Merry Garden
Rex	6		Ther	8 x 4 - 600	Own	Own		2	Yes	Axle	2¼	2	40 x8	..	Live	2		C. I		2150	Mohawk
Modine	6	Water	Ther	8¾x 6½-1200	Own	Own	Spur	1	Yes	Rim	2¾	2	51½x8	..	Dead		Knuckle	Channel		3380	Moline Universal
G. &O	3	W.&O	Ther	5½x 4¼-1500	Own	Own	Disc	1	Yes	Ax-Sp	2¼	2	3½x26½	..	Live	2	H. Bars	Iron	96	700	New Britain 1
G. & O	3		Ther	5½x 4¼-1500	Own			1	Yes	Ax-Sp	2¼	2	4 x32	..	Live	2	H. Bars	Iron	100	750	New Britain 2
Shotwell	12	Water	Pump	28 x 8 - 360		Twin	Disc	2		Chain	2½	3	52 x10	..	Live	2	Knuckle	Struct	100	6400	Nilson, Senior H
Own	10½	Oil	Pump	19 x 7 - 560	Own	Own	Shoe	2	No	Rim	2 1/10	2	51 x12	..	Live	2	Knuckle	Channel	80	6682	Oil-Pull 12-20
Own	15	Oil	Pump	23 x 8½- 530	Own	Own	Shoe	2	No	Rim	2 1/10	2	56 x18	..	Live	2	Knuckle	Channel	92½	9600	Oil-Pull 16-30
Own	17	Oil	Pump	26 x 4 - 450	Own	Own	Shoe	2	No	Rim	2	2	64 x20	..	Live	2	Knuckle	Channel	103	12820	Oil-Pull 20-40
Own	70	Oil	Pump	36 x11 - 375	Own	Own	Shoe	1	No	Rim	1 9/10	2	80 x30	..	Live	2	Swinging	I-Beam	141	26700	Oil-Pull 30-60
None		Air		4 x 4¼- 585	Own	Own	Shoe	1	Yes	Axle	2½	2	30 x8	..	Live	2	Power	Channel	72	1100	Oldsmar
Modine	10	Water	Pump	21½x 7 - 450	Own		Disc	2		Axle	2½			2	Live			Steel	60	8200	Oliver A
Perfex	10	Water	Pump	12 x 7½-1000	Own	Own	Disc	2	No	Rim	2½	2	60 x10	..	Revolving	2	Knuckle	Struct	91	5310	Parrett K

O—Opposed; **Splash-Gr**—Splash Gravity; **Sp-Pr**—Splash Pressure; **Struct**—Structural Steel; **T**—T-head; **Throt**—Throttle; **V**—Vertical; **Vac**—Vacuum. **EQUIPMENT—M-K**—Madison Kipp.

Specifications of American

Name and Model	Price	Plow Capacity	H.P. Rating	Engine Make	No. of Cylinders Bore & Stroke	Engine Type	Cylinders Cast	R.P.M.	Make of Governor	Type of Governor	Engine Weight	Lubrication System	Mechanical Lubricator Make	Oil Pump Type	Ignition System	Impulse Starter	Carbureter Make	Water Injected with Fuel	Fuel Feed	Fuel Tanks and Capacities	Air Cleaner Make
Peoria.....L	$1,785	3	12-25	Climax...	4-5 x6½	L...	Pairs..	800	Climax...	Cent....	1000	Pressure.	.....	Plunger..	Eisemann..	Yes.	Stromberg.	No..	Grv...	5G-30K.....	Tako.....
Pioneer.....18-36	.....	4	18-36	Own.....	4-5½x6	L...	Pairs..	750	Pierce....	Cent....	1300	Pressure.	Mansel..	.....	Berling....	Yes.	Kingston..	Yes.	Grv...	2G-23K.....	Bennett...
Pioneer.....30-60	.....	10	30-60	Own.....	4-7 x8	L...	Pairs..	625	Own.....	Cent....	4500	Pressure.	Detroit..	.....	K-W.....	Yes.	Kingston..	Yes.	Grv...	50G.....	Bennett...
Plowman.....A	1,995	3	15-30	Buda....	4-4½x6	L...	Block.	1000	Own.....	Cent....	1070	Pressure.	.....	Gear....	Splitdorf...	Yes.	Stromberg.	....	Grv...	2½G-17K...	Leonard...
Port Huron.....A	1,700	3	12-25	Chief....	4-4¾x6	I...	Block.	900	Pickering.	Throt...	1000	Pressure.	.....	Gear....	Eisemann..	Yes.	Kingston..	No..	Grv...	5G-25K.....	Own.....
Post.....D	.....	2	12-20	Waukesha	4-4¼x5¾	L...	Pairs..	800	Waukesha	Cent....	725	Circ-Sp..	.....	.....	Splitdorf...	Yes.	Kingston..	No..	Grv...	2G-13K.....	Bennett...
Ranger.....T-20	1,250	1	8-16	Le Roi...	4-3½x4½	L...	Block.	1100	Le Roi...	Cent....	345	Sp-Pr..	.....	Plunger..	Splitdorf...	No..	Holly.....	No..	Grv...	10G.....	Bennett....
Reliable.....10-20	985	2	10-20	Own.....	2-6 x7	I...	Block.	600	Own.....	Cent....	1120	Pressure.	Detroit..	.....	Splitdorf...	Yes.	Own.....	Yes.	Pump.	11K.....	.....
Rex.....12-25	1,600	3	12-25	Waukesha	4-4¼x5¾	L...	Pairs..	900	Waukesha	Cent....	670	Splash...	.....	Gear....	K-W.....	Yes.	Kingston..	No.. No..	Grv...	5G-20K.....	Bennett...
Samson.....M	1,060	2	.....	Northway	4-4 x5½	L...	Block.	1000	Own.....	Cent....	830	Circ....	.....	Gear....	Simms....	Yes.	Kingston..	No..	Grv...	3G-20K.....	Own.....
Sandusky.....J	.....	2	10-20	Own.....	4-4¼x5¼	L...	Block.	1000	Own.....	Cent....	850	Splash...	.....	Plunger..	Splitdorf...	Yes.	Kingston..	.....	Grv...	5G-15K.....	Bennett...
Sandusky.....E	.....	4	15-35	Own.....	4-5 x6½	L...	Singly.	800	Own.....	Cent....	2060	Splash...	.....	Plunger..	Splitdorf...	Yes.	Kingston..	No..	Grv...	5G-25K.....	Bennett...
Shelby.....D	.....	3	15-30	Beaver...	4-4¾x6	L...	Block.	900	Taco.....	Cent....	1100	Pressure.	.....	Gear....	Splitdorf...	Yes.	Kingston..	No..	Grv...	4G-14K.....	Bennett...
Shelby.....C	.....	2	10-20	Erd.....	4-4 x6	.....	.....	1000	.....	.....	.....	.....	.....	.....	Splitdorf...	....	Kingston..	No..	Grv...	5G-12K.....	Bennett...
Square Turn.....A	2,075	3	18-35	Climax...	4-5 x6½	I...	Pairs..	850	Climax...	Cent....	1150	Pressure.	.....	Vane....	Splitdorf...	Yes.	Stromberg.	No..	Grv...	15G-15K....	Bennett...
Stinson.....4-E	.....	4	18-36	Beaver...	4-4¾x6	I...	Block.	1000	Taco.....	Cent....	....	Pressure.	.....	Gear....	Splitdorf...	Yes.	Kingston..	Yes.	Grv...	5½G-26½K.	Own.....
Tioga.....T-3	2,625	3	15-27	Wisconsin	4-4½x6	L...	Block.	1000	Pharo....	Oil.....	1000	Sp-Pr...	.....	Gear....	Splitdorf...	Yes.	Stromberg.	No..	Grv...	28G.....	Bennett...
Titan.....10-20	1,200	3	10-20	Own.....	2-6½x8	I...	Pairs..	575	Own.....	Cent....	1691	Pressure.	M-K.....	.....	K-W.....	Yes.	Own.....	Yes.	Pump.	16K.....	Own.....
Topp-Stewart.....B	4,000	3	30-45	Waukesha	4-4¾x6¾	L...	Pairs..	950	Waukesha	Cent....	850	Sp-Pr...	.....	Gear....	Eisemann..	Yes.	Stromberg.	No..	Grv...	25G.....	Bennett...
Traylor.....T	815	1	6-12	Le Roi...	4-3½x4½	L...	Block.	1200	Le Roi...	C. D....	330	Pressure.	.....	Plunger..	Splitdorf...	No..	Kingston..	No.	Grv...	10G.....	A. P. Co...
Turner.....14-25	1,695	3	14-25	Buda....	4-4¼x5½	L...	Block.	1000	Duplex...	Cent....	700	Pres ure.	.....	Gear....	Splitdorf...	Yes.	Kingston.	Yes.	Pump.	15G-5K.....	Bennett...
Twin City.....12-20	.....	3	12-20	Own.....	4-4¼x6	I...	Block.	1000	Own.....	Cent....	900	Circ-Pr..	.....	Gear....	Bosch.....	Yes.	Holley....	No..	Grv...	3G-23K.....	Bennett...
Twin City.....20-35	.....	5	20-35	Own.....	4-5½x6¾	L...	Block.	900	Own.....	Cent....	1800	Circ-Pr..	.....	Gear....	Bosch.....	Yes.	Holley....	No..	Grv...	1½G-40K...	Bennett...
Twin City.....40-65	.....	8	40-65	Own.....	4-7¾x9	I...	Singly.	535	Own.....	Cent....	3500	Splash...	Detroit..	.....	K-W.....	Yes.	Holley....	No..	Pump.	10G-95K....	.....
Uncle Sam.....C-20	1,385	2-3	12-20	Weidely..	4-4 x5½	I...	Block.	1200	Own.....	Cent....	770	Sp-Pr...	.....	Gear....	Splitdorf...	....	Kingston..	No..	Grv...	19G or K....	Bennett...
Uncle Sam.....B-19	2,300	3-4	20-30	Beaver...	4-4¾x6	I...	Block.	1000	Duplex...	Cent....	1050	Sp-Pr...	.....	Gear....	Splitdorf...	Yes.	Bennett...	No..	Grv...	5G-20K.....	Bennett...
Utilitor.....501	380	5-7	2-4	.....	1-3½x4½	L...	Single.	1000	Edco.....	Cent....	....	Splash...	.....	.....	Eisemann..	No..	Holly.....	No..	Grv...	.....	Own.....
Victory.....15-30	1,750	3	15-30	Waukesha	4-4¼x5¾	....	Pairs..	1000	Waukesha	Cent....	750	Sp-Pr...	.....	Plunger..	Splitdorf...	Yes.	Miller.....	No..	Grv...	25G.....	Bennett...
Victory.....9-18	1,385	2	9-18	Gray.....	4-3½x5	I...	Block.	1000	Pierce....	Cent....	500	Sp-Pr...	.....	Plunger..	Splitdorf...	Yes.	Carter....	No..	Grv...	25G.....	Bennett...
Vim.....15-30	1,650	3	15-20	Waukesha	4-4⅜x5¾	L...	Pairs..	1000	Waukesha	Cent....	845	Press....	.....	Gear....	Simms....	No..	Bennett...	No..	Grv...	3G-12K.....	R. W.....
Wallis.....K	.....	3	15-25	Own.....	4-4¼x5¾	I...	Block.	900	Own.....	Hyd....	750	Splash...	.....	Plunger..	Berling....	Yes.	Bennett...	No..	Grv...	20K.....	Bennett...
Waterloo.....N	.....	3	12-25	Own.....	2-6½x7	I...	Block.	750	Own.....	Cent....	1200	Spray....	.....	Plunger..	Splitdorf...	Yes.	Schebler...	Yes.	Grv...	1G-20K.....	.....
Wellington.....B	.....	2-3	12-22	Erd.....	4-4 x6	....	Block.	900	Erd.....	.....	1000	Sp-Pr...	.....	Plunger..	Splitdorf...	Yes.	Stromberg.	No..	Grv...	10G-20K....	Ross.....
Wellington.....F	.....	3-4	16-30	Chief....	4-4¾x6	I...	Block.	900	Chief....	Cent....	1250	Sp-Pr...	.....	Gear....	Splitdorf...	Yes.	Stromberg.	No..	Grv...	10G-20K....	Ross.....
Wetmore.....12-25	1,650	3	12-25	Waukesha	4-4 x5¾	L...	Pairs.	1000	Waukesha	Cent....	900	Pressure.	.....	Gear....	Splitdorf...	Yes.	Schebler...	No..	Grv...	2½G-12K...	.....
Whitney.....9-18	1,175	2	9-18	Own.....	2-5½x6½	L...	Singly.	750	Own.....	Cent....	650	Pressure.	M-K.....	.....	Splitdorf...	Yes.	Bennett...	No..	Grv...	10G.....	Bennett...
Wichita.....T	2,500	3	30-15	Beaver...	4-4½x6	I...	Block.	950	Duplex...	Cent....	1000	Sp-Pr...	M-K.....	.....	Berling...	Yes.	Ensign....	No..	Grv...	½G-25K.....	Bennett...
Wisconsin.....	2,250	4	16-30	Climax...	4-5 x6½	L...	Pairs.	800	Climax...	Cent....	1350	Pressure.	.....	Gear....	Eisemann..	Yes.	Stromberg.	No..	Grv...	6G-25K.....	Bennett...
Zelle.....12-25	.....	2	12-25	.....	4-4¼x5½	L...	Block.	1000	.....	Cent....	600	Sp-Pr...	.....	Plunger..	.....	Yes.	Carter....	Yes.	Vac...	5G-25K.....	Leonard...

ABBREVIATIONS—Cent—Centrifugal; **Circ**—Circulating; **Circ-Pr**—Circulating Pressure; **Circ-Sp**—Circulating Splash; **Cont**—Contracting; **Elec**—Electric; **Expand**—Expanding; **Fric**—Friction; **Grv**—Gravity; **H**—Horizontal; **Hyd**—Hydraulic; **Ind**—Individual; **L**—L-Head;

ft. p.m. adopted by the S. A. E. some years ago, the average for different classes going up somewhat with the plow capacity. The average wheelbase of the two and three-plow tractors has decreased, whereas that of the four-plow tractors has increased.

The relation between knuckle steering and axle steering remains the same. Of the new tractors that have come out during the year 1920 a majority have been of the frameless type. The average diameter of the driving wheels remains substantially the same for two and three-plow tractors, but has come down by 2 in. in the case of four-plow tractors. An appreciable decrease in weight is shown for each capacity class of tractor.

ANALYSIS OF THREE YEARS' TRACTOR SPECIFICATIONS*

	1919	1920	1921
Form of traction			
Wheel tractors	86%	85.5%	94%*
Creeper tractors	14%	14.5%	6%
Plow Capacity (14-in. bottoms)			
Single-plow tractors	2%	6.6%	8%*
Two-plow tractors	13%	18.9%	17%
Three-plow tractors	49%	41.5%	36%
Four-plow tractors	22%	16%	16%
Five or more plow tractors.	14%	17%	15%
Engine Cylinder Number			
Single-cylinder engines	1%	....	2%*
Two-cylinder engines	16%	19%	15%
Four-cylinder engines	82%	80%	81%
Six-cylinder engines	....	1%	2%
Eight-cylinder engines	1%	....	....
Type of Engine			
Horizontal	28%	25.5%	24%*
Vertical	72%	74.5%	76%
Cylinder Castings, Four-Cylinder			
Block-cast	55%	52%	54%*
Pair-cast	35%	41%	38%
Single-cast	10%	7%	8%
Average Piston Displacement			
Two-plow tractors	240 cu. in.	290 cu. in.	261 cu. in.
Three-plow tractors	370 cu. in.	422 cu. in.	386 cu. in.
Four-plow tractors	450 cu. in.	575 cu. in.	528 cu. in.
Average Engine Weight			
Per cu. in. displacement	2.4 lb.	2.69 lb.	....
Per belt horsepower	36 lb.	39 lb.	....
Fuel Feed			
Gravity	88%	83%	86%*
Pump	8%	10%	9%
Vacuum	4%	7%	5%
Cooling Water Circulation			
Pump	93%	83%	74%*
Thermo-siphon	7%	17%	26%
Engine Lubrication			
Gear type pump	34%	51%	47%*
Piston type pump	29%	21%	27%
Vane type pump	....	3%	4%
Mechanical lubricators	37%	25%	22%
Average Piston Speed			
Four-cylinder engines	....	860 ft.p.m.	883 ft.p.m.
Types of Clutch			
Friction drive (no clutch).	13%	4%	7%*
Cone	10%	11%	3%
Disk	34%	48%	60%
Block	43%	37%	30%

Farm Tractors for 1921—(Continued)

Radiator Make	Cooling System Capacity	Cooling Fluid	Fluid Circulation	Belt Pulley Diameter; Face and R.P.M.	Gearset Make	Clutch Make	Clutch Type	No. of Forward Speeds	Differential Lock	Final Drive	Plowing Speed	No. of Driving Wheels	Diameter and Face	No. of Tracks	Drive Wheel Axle Type	No. of Non-drive Wheels	Steering Arrangement	Frame Material	Wheelbase	Total Weight	Name and Model
Eureka...	12	Water.	Pump.	16 x 7 - 650	Own....	Own.....	Cone...	3	No...	Axle.....	3	2	50 x12	....	Live.....	2	Knuckle..	Steel....	80	4700	Peoria.....L
S. J.....	13	Water.	Pump.	14 x 7 ...	Own....	Own.....	Disc...	3	No...	Spokes...	2¾	2	60 x18	....	Revolving.	2	Knuckle..	Steel....	89	6500	Pioneer.....18-36
S. J.....	25	Water	Pump.	18 x15 - 625	Own....	Own.....	Disc...	3	No...	Spokes...	2½	2	96 x24	....	Revolving.	2	Knuckle..	Channel.	140	23000	Pioneer.....30-60
Perfex...	12	Water	Pump.	14 x 8 - 590	Foote...	Twin.....	Disc...	2	No...	Rim.....	3	2	60 x12	....	Dead.....	2	Knuckle..	Channel.	99	5400	Plowman .....A
Bremer ..	8¾	Water	Pump.	14 x 8 - 650	Own....	Rock.....	Fric...	2	No...	Rim.....	2	2	56 x10	....	Revolving.	2	Knuckle..	Channel.	93	5960	Port Huron.....A
Perfex...	9	Water	Pump.	14 x 6 - 700	Fuller...	Fuller.....	Disc...	3	No...	Axle.....	2¾	2	32 x4	....	Live.....	2	Power ...	Steel....	108	4500	Post .....D
Bremer ..	2½	Water	Ther..	5 x 1 - 500	Own....	Borg & Beck.	Plate...	1	Yes..	Rim.....	1½	4	30 x6½	....	Dead	none	Own.....	Steel....	110	1100	Ranger .....A
Tank....	50	Water	Pump.	18 x 7 - 600	Own....	.....	.....	2	No...	Axle.....	2 1/1	2	48 x10	....	Live.....	2	Swinging	Struct..	77	3785	Reliable 10-20
Perfex...	9	Water	Pump.	12 x 7 - 900	Own....	Own.....	Shoes..	2	No...	Gears....	2¼	2	60 x1	....	Revolving	2	Knuckle..	Channel.	84	5500	Rex.....12-25
Own.....	10	Water	Pump.	18 x 6 - 375	Own....	Own.....	Disc...	2	No...	Axle.....	2	2	45 x12	....	Live.....	2	Knuckle..	.....	64¼	3233	Samson .....M
Perfex...	8	Water	Pump.	8 x 6 -1000	Own....	Own.....	Cone.	2	No...	Rim.....	3	2	48 x10	....	Live.....	2	Knuckle..	Channel.	66	4320	Sandusky.....J
Perfex...	30	Water	Pump.	15 x10 - 800	Own....	Own.....	Shoe...	3	No...	Rim.....	2	2	56 x16	....	Live.....	2	Swinging.	Channel.	100	9300	Sandusky.....E
Modine..	6	Water.	Pump.	14 x 8 - 650	Foote...	Twin.....	Disc...	2	No...	R.Spokes-	3½	2	48 x12	....	Live.....	2	Knuckle..	Channel.	80	4800	Shelby.....D
Modine..	.....	.....	.....	10 x 7 - 850	.....	Fuller.....	Disc...	3	.....	.....	3	2	44 x12	....	.....	2	.....	Channel.	72	3400	Shelby.....C
Modine...	10	Water.	Pump.	12 x 8 - 850	Own....	.....	.....	2	No...	Rim.....	2½	2	60 x12	....	Dead.....	1	Swinging.	Struct...	130	7500	Square Turn.....A
Todd....	10	Water.	Pump.	12 x 8 -1000	Own....	Own.....	Spur...	1	No...	Axle.....	2⅞/10	2	60 x12	....	Live.....	2	Knuckle.	Steel....	114	7100	Stinson.....4-E
G. & O...	10	Water.	Pump.	12 x 7 - 700	Own....	Twin.....	Disc...	2	Yes..	Hub.....	2 7/10	2	36 x16	....	Dead.....	2	Knuckle..	Channel.	80	4950	Tioga.....T-3
Own.....	40	Water.	Ther..	18 x10½- 575	Own....	Own.....	Shoe...	2	No...	Spokes...	2¾	2	54 x10	....	Live.....	2	Knuckle..	Struct...	91	5710	Titan.....10-20
Bremer...	12	Water.	Pump.	10 x 8 - 950	Own....	Hilliard....	Disc...	3	No...	Rim.....	2½	4	42 x12	....	Live.....	none	Swinging.	Struct...	100	7500	Topp-Stewart.....B
G. O.....	3	Water.	Ther..	8 x 6 -1200	Own....	Borg & Beck.	Plate..	1	No...	Rim.....	3	2	38 x10	....	Live.....	2	Knuckle..	Steel....	69	1750	Traylor.....T
Perfex...	5	Water.	Pump.	.. x14 - 650	Foote...	Twin Disc..	Disc...	2	Yes..	Rim.....	2½	2	54 x12	....	Dead.....	2	Knuckle..	Struct...	80	4300	Turner.....14-25
Modine...	10	Water.	Pump.	16 x 6½ ...	Own....	Twin.....	Disc...	2	No...	Axle.....	2 9/10	2	50 x12	....	Live.....	2	Knuckle..	Channel.	84	4300	Twin City.....12-20
Modine...	10	Water.	Pump.	21 x 8½ ...	Own....	Twin.....	Disc...	2	No...	Axle.....	2.9	2	60 x20	....	Live.....	2	Knuckle..	Channel.	97	8350	Twin City.....20-35
Own.....	130	Water.	Pump.	23 x10½ ...	Own....	Own.....	Shoe...	1	No...	Rim.....	1.9	2	84 x24	....	Revolving.	2	Knuckle..	Steel....	144	23700	Twin City.....40-65
Perfex....	12	Water.	Pump.	12 x 6 -1200	Own....	Borg & Beck.	Plate...	2	No...	Chain....	3½	2	45 x10	....	Live.....	2	Knuckle..	Struct...	71	3500	Uncle Sam.....C-20
Perfex....	12	Water.	Pump.	11 x 8½- 900	Nuttall..	Twin.....	Disc...	2	No...	Axle.....	2½	2	50 x12	....	Live.....	2	Knuckle..	Struct...	85	4500	Uncle Sam.....B-19
Fedders..	.....	Water.	Ther..	4½x 3¾-1000	.....	.....	.....	.....	.....	.....	2½	2	25	....	.....	2	Clutches..	.....	.....	750	Utilitor.....501
Own.....	5½	Water.	Pump.	10 x 6 -1000	Own....	Borg & Beck.	Plate..	2	Yes..	Axle.....	2¼	2	48 x12	....	Live.....	2	Knuckle..	Steel....	72	3500	Victory.....15-30
Own.....	5	Water.	Ther..	10 x 6 -1000	Own....	Borg & Beck.	Plate..	2	Yes..	Axle.....	2¾	2	48 x12	....	Live.....	2	Knuckle..	Steel....	72	3250	Victory.....9-18
B. W....	1	Water.	Pump	10 x 7 -1000	Own....	Borg & Beck.	Plate..	2	No...	Axle.....	3	2	48 x12	....	Live.....	2	Knuckle..	Channel.	72	4000	Vim.....15-30
Modine...	6	Water.	Pump.	18 x 6¾- 430	Own....	Twin.....	Disc...	2	No...	Axle.....	2½	2	48 x12	....	Live.....	2	Knuckle..	Steel....	84	3560	Wallis.....K
Modine...	13	Water.	Pump.	14 x 8 - 750	Own....	Own.....	Shoe...	2	No...	Rim.....	2⅝	2	52 x12	....	Revolving.	2	Knuckle..	Struct...	88	5850	Waterloo.....N
Modine...	8	Water.	Pump.	14 x 6½- 740	Foote...	Twin.....	Disc...	.....	.....	Rim.....	.....	2	48 x12	....	.....	.....	Knuckle..	Struct...	78	4200	Wellington.....B
Modine...	10	Water.	Pump.	14 x 8½- 740	Foote...	Twin.....	Disc...	.....	No...	Axle.....	.....	2	48 x14	....	.....	2	Knuckle..	Struct...	72	5000	Wellington.....F
Ideal....	8	Water.	Pump.	12 x 7 - 900	Fuller...	Fuller.....	Disc...	3	No...	Spokes...	3½	2	46 x10	....	Dead.....	2	Knuckle..	Steel....	72	2900	Wetmore.....12-25
Modine...	7	Water.	Pump.	11 x 6¾- 750	Own....	Own.....	Shoe...	3	No...	Axle.....	2½	2	48 x10	....	Live.....	2	Knuckle..	Channel.	82	2850	Whitney.....9-18
Perfex....	9	Water.	Pump.	10½x 6 - 950	Nuttall..	Twin.....	Disc...	2	No...	Axle.....	2 6/10	2	48 x12	....	Live.....	2	Knuckle..	Struct...	93	6000	Wichita.....T
Perfex....	12	Water.	Pump.	16 x 8 - 600	Foote...	Twin.....	Disc...	2	No...	Rim.....	3½	2	52 x12	....	Revolving.	2	Knuckle..	Channel.	86	5440	Wisconsin.....
Harrison.	12	Water.	Pump.	12 x 7 -1000	Own....	Borg & Beck.	Plate...	4	No...	Rim.....	2⅛	2	54 x12	....	Revolving.	2	Knuckle..	Steel....	72	3800	Zelle.....12-25

O—Opposed; **Splash-Gr**—Splash Gravity; **Sp-Pr**—Splash Pressure; **Struct**—Structural Steel; **T**—T-head; **Throt**—Throttle; **V**—Vertical; **Vac**—Vacuum. **EQUIPMENT—M-K**—Madison Kipp.

	1919	1920	1921
Number of Forward Speeds			
One	17.4%	19.7%	15%*
Two	63%	55%	58%
Three	15.3%	22%	24%
Four or more	4.3%	3.3%	3%
Average Wheelbase			
Two-plow tractors	83.5 in.	82.5 in.	79.5 in.
Three-plow tractors	96 in.	90 in.	85 in.
Four-plow tractors	97 in.	93.5 in.	100 in.
Method of Steering			
Knuckle	83%	74%	74%*
Swinging axle	17%	26%	26%
Average Diameter of Drive Wheels			
Two-plow tractors	50 in.	46.5 in.	46.3 in.
Three-plow tractors	52 in.	53 in.	53.4 in.
Four-plow tractors	....	59 in.	57 in.

Average Weights	1919	1920	1921
Two-plow tractors	3,670 lb.	4,000 lb.	3,721 lb.
Three-plow tractors	5,100 lb.	5,450 lb.	5,218 lb.
Four-plow tractors	6,050 lb.	7,800 lb.	7,461 lb.

*It should be noted that the figures given in this table are based upon specifications published in AUTOMOTIVE INDUSTRIES, this data being compiled from replies to questionnaires sent out for the purpose. In some cases the complete data requested is not furnished, hence the figures given are based upon returns actually made. For example, if 60 out of 100 tractors are reported to have vertical engines and 30 to have horizontal engines (10 makes failing to give data on this point), the table would show 66.7 per cent vertical engines and 33.3 per cent horizontal, the assumption being that of the 10 not reporting the percentage of vertical and horizontal will be the same as in the case of those reporting.

Forest Fire Patrol Activities from March Field

A CONSOLIDATED report of forest fire patrol activities carried on from March Field from May 19th to October 31, 1920, gives some interesting statistics.

Total number of flights	314
Total flying time	1,143 hrs. 38 min.
Total gallons gasoline consumed	19,990
Total gallons of oil consumed	1,222¼
Area of square miles covered	131,479,493
Total miles flown	108,920
Total number of fires discovered	131
Total number of planes flown (DH-4B's)	6
Total number of minor accidents	1
Total number of major accidents	None

This patrol was carried on under the direction of Captain Ernest Clark, officer in charge of flying at this field. Pilots were graduate cadets from this school. C. R. Benton, forester, was stationed at the field during the patrol season, relaying information about fires from the radio station to the various rangers in the mountain reserves.

Gas Tractor Engine Exports—Increase from 1914 to 1920

Large business with Canada continues during 1920, while nearly 20 per cent of engines exported go to South American countries.

A GAIN of 10 per cent in the number of gas tractor engines exported from the United States is recorded for 1920 over the 1919 figures. During the last year 22,481 engines were sent to foreign countries, 2045 more than were exported during the previous year.

Canada received the largest number of these exported engines during 1920, its total being 9606, while the Philippine Islands came next with a total of 1461. A few of the countries to receive the largest number of engines during the past year are:

Canada	9,606
France	2,071
Philippine Islands	1,461
England	977
Argentina	920
Peru	701
Australia	600
Spain	492

To South America as a whole went 4295 engines, comprising slightly over 19 per cent of the total gas tractor engine exports. The value of the engines sent to South America was $2,218,464 which is about 9.9 per cent of the total value of gas tractor engines exported during the year 1920.

This indicates that the South American countries were larger buyers of light gas tractor engines than the rest of the world as a whole, and that the market for small engines is better than for heavy ones in this section. This is further borne out by the fact that the average value of all engines exported in 1920 was $978, while the average value of those sent to South America alone was but $516.

Following is the average value of gas tractor engines exported each year:

1914	$1,965
1915	2,152
1916	2,040
1917	1,320
1918	1,018
1919	980
1920	978

This shows a steady decrease in the average price

Gas Tractor Engine

	1914	1915	1916	1917	1918	July 1 to Dec. 31 1918	Calendar Year 1919	1920	Total for all years
Europe:									
Austria-Hungary	20 $58,977								20 $58,977
Belgium							232 $191,710	156 $128,830	388 $320,540
Bulgaria	8 $9,433							26 $27,061	34 $36,494
Denmark			7 $23,905	7 $9,130	1 $2,370	2 $6,800	899 $770,715	192 $170,374	1,108 $983,294
Finland							5 $6,800	29 $67,823	34 $74,623
France	2 $4,986	25 $100,500	981 $744,240	1,201 $1,259,232	2,157 $2,428,335	555 $1,036,879	4,620 $5,066,823	2,071 $1,691,594	10,918 $12,332,549
Germany	47 $121,652						35 $22,820	4 $2,812	86 $147,284
Greece					91 $95,500	39 $16,800	126 $85,723	36 $40,051	295 $238,074
Iceland and Faroe Islands							3 $4,550	2 $3,208	5 $7,758
Italy	1 $3,683			135 $125,043	5,406 $4,742,132	2,570 $3,229,190	375 $682,379	53 $81,782	8,540 $8,864,209
Netherlands	1 $3,750			4 $7,400			55 $62,295	122 $93,376	182 $166,821
Norway				39 $58,648	1 $1,093	105 $125,890	138 $139,624	159 $182,891	442 $508,146
Poland and Danzig								261 $217,737	261 $217,737
Portugal			1	$495	20 $31,239		39 $52,787	17 $49,589	77 $134,110
Roumania	23 $55,320						106 $127,178	77 $114,610	206 $297,108
Russia in Europe	67 $196,617	90 $69,370	41 $84,550	139 $353,666	366 $959,424		7 $9,000	10 $10,200	656 $1,682,827
Serbia, Montenegro, etc.			20 $27,000				1 $584		21 $27,584
Spain	2 $7,405		1 $1,050	53 $55,169	19 $11,728	8 $11,030	182 $212,985	492 $553,055	750 $852,422
Sweden				6 $5,301			275 $248,134	333 $438,105	614 $691,543
Switzerland					1 $2,339		21 $18,078	1 $1,625	23 $22,042
Turkey in Europe							20 $28,564	3 $5,021	23 $33,585
United Kingdom:									
England		80 $343,922	611 $1,843,229	2,920 $4,747,841	8,869 $8,807,131	1,029 $1,524,521	2,088 $1,490,515	977 $916,324	16,603 $19,673,483
Scotland		1 $1,562			64 $105,882	9 $52,466	1 $600	31 $24,967	106 $185,477
Ireland				51 $39,325			354 $209,613		405 $238,938
Jugoslavia, Albania, etc.								7 $8,622	7 $8,622
North America:									
British Honduras		1 $298		3 $8,315					4 $8,613
Canada	889 $637,162	252 $281,867	687 $693,328	2,909 $3,047,523	5,824 $5,774,288	3,208 $2,628,569	6,733 $6,336,233	9,606 $8,420,955	29,603 $27,819,925
Central American States:									
Costa Rica				1 $2,275			5 $7,057	21 $16,591	27 $25,923
Guatemala					1 $802		4 $3,453	53 $44,675	58 $48,930
Honduras	2 $3,689		5 $8,928	5 $7,302			8 $13,835	8 $21,972	28 $55,719
Nicaragua	2 $2,170				2 $2,800	2 $3,781		9 $15,718	15 $24,469
Panama		2 $9,488			16 $12,412	7 $5,600	12 $15,739	3 $4,779	40 $48,018
Salvador				1 $2,800		1 $1,400	3 $5,800	5 $6,088	10 $16,088
Mexico	5 $13,600	5 $12,400	28 $41,449	59 $91,902	285 $430,472	113 $150,585	291 $326,855	391 $775,133	1,175 $11,447,396
Newfoundland and Labrador							4 $15,996	2 $9,855	6 $25,851
West Indies, British:									
Barbados					3 $2,015		8 $6,424	4 $3,225	15 $11,664
Jamaica					1 $230	8 $7,614	13 $16,034	16 $17,995	38 $41,873
Trinidad and Tobago					1 $1,632	5 $8,349	11 $15,076	11 $23,981	28 $49,038
Other British					2 $1,708	1 $1,496	3 $2,550	6 $5,966	12 $11,720
Cuba	15 $54,845	24 $77,531	60 $135,309	179 $209,157	165 $247,662	110 $154,615	253 $345,404	390 $606,739	1,196 $1,831,262
Dominican Republic			1 $858	1 $4,650	4 $3,590		14 $14,814	47 $126,239	67 $150,151
Danish West Indies (Virgin Is.)						3 $3,525	2 $2,177	12 $18,940	17 $24,642
Dutch		1 $1,525					2 $704		3 $2,229
French					2 $2,095		8 $10,065	3 $1,953	13 $14,113

Exports 1914-1920

	1914	1915	1916	1917	1918	July 1 to Dec. 31 1918	Calendar Year 1919	1920	Total for all years
Haiti	.....	.....	.....	.....	1 $1,150	.....	13 $16,146	9 $34,490	23 $51,786
South America:									
Argentina	73 $103,915	4 $1,828	18 $37,926	5 $7,848	7 $4,050	46 $66,778	528 $393,807	980 $721,527	1,601 $1,337,679
Bolivia	.....	.....	.....	.....	.....	4 $6,300	7 $4,950	9 $3,519	20 $14,769
Brazil	6 $8,326	1 $2,724	5 $3,216	8 $7,499	4 $11,600	11 $12,600	96 $75,054	269 $308,236	400 $429,255
Chile	4 $10,540	1 $1,346	.....	1 $3,175	16 $18,296	2 $2,922	167 $169,552	333 $304,242	524 $510,073
Colombia	1 $3,620	.....	1 $2,100	.....	12 $10,728	1 $4,377	.....	14 $34,890	29 $55,715
Ecuador	.....	.....	.....	.....	.....	.....	5 $7,125	5 $6,000	10 $13,125
Guiana, British	.....	.....	.....	1 $3,100	16 $13,727	17 $16,683	32 $47,820	76 $96,719	142 $178,049
Guiana, Dutch	.....	.....	.....	.....	.....	.....	2 $2,536	8 $19,739	10 $22,275
Guiana, French	.....	.....	.....	.....	.....	.....	.....	1 $4,814	1 $4,814
Paraguay	1 $1,638	.....	.....	.....	6 $7,111	.....	.....	2 $8,050	9 $16,799
Peru	2 $5,865	2 $3,971	.....	10 $19,508	83 $101,594	154 $182,418	317 $314,018	701 $552,360	1,269 $1,179,734
Uruguay	.....	.....	.....	.....	.....	7 $5,495	59 $46,773	112 $100,825	178 $153,093
Venezuela	3 $3,753	.....	.....	3 $8,237	.....	.....	22 $26,149	45 $57,543	73 $95,682
Asia:									
China	.....	.....	.....	4 $3,396	.....	.....	7 $13,091	14 $29,814	25 $46,301
Kwantung, leased territory	.....	.....	.....	3 $2,898	.....	.....	1 $2,670	2 $2,600	6 $8,168
Chosen	.....	.....	.....	.....	.....	.....	14 $22,271	.....	14 $22,271
East Indies: British:									
British India	2 $4,629	.....	.....	3 $1,900	1 $2,842	2 $2,318	105 $86,437	315 $294,668	428 $392,794
Straits Settlements	.....	1 $3,000	.....	.....	1 $2,063	.....	32 $26,818	145 $207,281	179 $239,162
Other	.....	.....	.....	.....	.....	.....	13 $8,110	17 $11,160	30 $19,270
Dutch	.....	5 $18,217	3 $12,421	5 $24,400	2 $10,241	7 $5,847	47 $68,248	184 $352,725	253 $492,099
French	.....	.....	.....	.....	1 $4,900	.....	2 $1,552	73 $58,024	76 $64,476
Hong Kong	.....	.....	.....	.....	.....	.....	.....	1 $3,303	1 $3,303
Japan	.....	.....	.....	14 $20,332	5 $15,016	11 $13,302	50 $172,036	146 $119,000	226 $339,686
Russia in Asia	.....	.....	.....	113 $305,192	.....	.....	2 $7,500	.....	115 $312,692
Siam	.....	.....	.....	.....	.....	.....	3 $8,047	12 $19,588	15 $27,635
Turkey in Asia	1 $2,762	.....	.....	.....	.....	.....	1 $440	25 $27,868	27 $31,070
Oceania: British:									
Australia	42 $71,428	18 $37,144	32 $37,441	22 $25,015	21 $19,505	21 $24,122	252 $279,371	600 $487,152	1,008 $981,179
New Zealand	.....	.....	16 $16,839	54 $57,863	40 $46,499	286 $181,588	170 $180,592	322 $360,734	888 $844,115
Other British	.....	.....	.....	2 $2,964	.....	.....	.....	3 $2,040	5 $5,004
German	.....	.....	.....	.....	.....	.....	1 $614	.....	1 $614
French	.....	.....	.....	1 $1,453	.....	.....	.....	2 $1,929	3 $3,382
Philippine Islands	.....	3 $12,992	2 $9,560	7 $9,137	13 $28,107	52 $102,408	687 $769,045	1,461 $1,763,878	2,225 $2,695,127
Africa:									
Belgian Kongo	.....	.....	.....	.....	.....	.....	1 $3,417	.....	1 $3,417
British Africa:									
West	1 $4,760	.....	.....	.....	.....	.....	.....	6 $30,068	7 $34,828
South	4 $11,399	3 $3,613	2 $1,527	4 $3,240	36 $21,267	14 $9,900	325 $189,392	407 $413,015	795 $653,353
East	.....	.....	.....	.....	.....	1 $300	15 $20,849	61 $71,478	77 $92,627
Egypt	3 $7,988	.....	.....	.....	.....	7 $2,185	29 $23,249	170 $188,680	209 $222,102
French Africa	1 $2,289	.....	.....	8 $8,305	1 $1,124	7 $5,250	363 $390,261	344 $278,181	724 $685,410
Morocco	.....	.....	.....	.....	1 $1,180	1 $575	110 $71,569	6 $8,447	118 $81,771
Portuguese Africa	.....	.....	1 $1,620	.....	3 $7,144	.....	2 $6,970	15 $30,911	21 $46,645
Totals	721 $1,416,294	455 $983,198	1,858 $3,726,496	7,988 $10,540,639	23,560 $23,995,023	8,426 $9,614,479	20,436 $20,026,172	22,481 $21,965,959	85,925 $92,268,260

since 1915, indicating that there has been an increased sale of lighter engines, and that it is to this class of gas tractor engine that much of the increased export trade in this field may be attributed.

The value of tractor engine exports increased in 1920 to $21,965,959, a gain of $1,937,787 over 1919. This is an increase of 9.79 per cent. The enormous jump in the value of gas tractor engine exports during the last seven years can be readily perceived, when it is noted that a value gain of 1430 per cent has been made during that time.

It is interesting to note which countries have bought the most from U. S. gas tractor engine manufacturers during the seven years covered by the accompanying table. As might be expected, such an examination shows the largest business to have been done in general with the largest countries. The first five are in order as follows:

Canada	$27,819,925
England	19,673,483
France	12,332,549
Mexico	11,447,396
Italy	8,864,209

The large business with Canada may be attributed to its proximity and the freedom of intercourse between U. S. and Canada during the war period. The large Mexican total, it will be noted, is due rather to a steady business each year, rather than to extremely large sales in any one year. This steady business has remained on a high level since 1918 and has reached a new high mark in 1920.

Weight per Sq. Ft. of Sheet Steel

Gage	lb. per sq. ft.
0000000	20.00
000000	18.75
00000	17.50
0000	16.25
000	15.
00	13.75
0	12.50
1	11.25
2	10.625
3	10.
4	9.375
5	8.75
6	8.125
7	7.5
8	6.875
9	6.25
10	5.625
11	5.
12	4.375
13	3.75
14	3.125
15	2.8125
16	2.5
17	2.25
18	2.
19	1.75
20	1.50
21	1.375
22	1.25

British Agricultural Tractor Practice in 1921

No standard type yet developed. All engines are vertical but some are of low speed type and one uses fuel injection. Two speed gearset usually provided. Creeper types in favor with British farmers.

By M. W. Bourdon

THE accompanying list of agricultural tractors made in Great Britain indicates that the manufacture of these is a very extensive industry. The lead set by Ford has been followed by Austin, but this maker is practically alone among British manufacturers in adopting a comparatively high-speed lightweight motor in a compact and lightweight frameless machine with four wheels and two tracks.

There is actually no one type of tractor which can be said to represent general practice among British makers, but there is a tendency to favor a somewhat heavier machine than the Ford or Austin, with a larger engine than either of the latter. The new makes following these lines which have created a good impression are the Martin tractor, as distinct from the self-contained plow of that name, and the Peterborough, the latter having a Ricardo trunk piston engine. The British Wallis also exemplifies this type; it is made by a prominent engineering firm, Ruston, Proctor & Co., Lincoln, and has many modifications compared with the American Wallis, making it more compatible with British ideas. It is a four-wheeled machine with two tracks, and secured the highest award in its class in the British Tractor Trials last September.

There is no British tractor manufacturer using a horizontal engine, but the low speed of revolution which the horizontal type suggests occurs in the Sanderson. The Blackstone, which has a motor also with a normal speed of 750 r.p.m., is of a special type with three cylinders and low-tension magneto ignition. It also has a special vaporizing system in which the fuel is injected directly into the cylinders, the latter being previously charged with air under pressure. This engine is fitted with a compressed air starter, but generally speaking the Blackstone tractor has yet to prove its serviceability in practical use. The Glasgow three-wheel drive three-track machine, with a Continental engine, is making a good name for itself and is slowly getting into production, though it is the intention eventually to fit it with an Argyll-Burt single sleeve motor and to quadruple at least the present output of approximately 12 to 15 tractors per week.

There is a tendency to fit more efficient brakes to British tractors, the latter in several cases being provided with expanding shoes within wheel drums, these supplementing a block applying to the belt pulley.

Except in those machines designed for road haulage as well as work on the land, two forward speeds are most generally provided; but in regard to final drive there is no uniformity, practically every available system being utilized by one maker or another. The chain track machine is represented by only one example that counts, namely, the Martin self-contained plow. Both the Crawley and the Fowler, other self-contained implements, are of the wheeled type with the motor balanced against the plow, respectively front and back of the main axle. The chain track machine does not find much favor among British farmers, and it is anticipated that before long this type will not be produced by any British agricultural tractor manufacturer.

British Agricultural Tractor Specifications for 1921

No.	Make	Make of Engine	Cylinders Bore and Stroke	Normal R.P.M.	Lubrication System	Type of Oil Pump	Make of Carburetor	Fuel	Water Injection	Air Cleaner	Type Dry or Wet	Water Circulation	Type of Clutch	No. of Forwd. Speeds	Final Drive	Traction Wheel or Chain	No. of Tracks	No. of Driving Wheels	No. of Non-Driving Wheels	Wheelbase	Engine and Gearset as Unit	Weight	Ploughing Speed
1	Austin	Own.	4-3¾x5	1500	F.F.	G.	Zenith	K.	No.	Yes.	.....	Ther.	Cone.	2	Spur.	Wh.	2	2	2	68	Yes.	2900	2½-3
2	Blackstone	Own.	3-5 x6½	750	F.F.	G.	Own.	K.	Yes.	No.	.....	Pmp.	Cone.	3	Spur.	Ch-T.	2	.....	.....	.....	No.	5040	3
3	Crawley	Own.	4-4½x5½	1100	Pres	G.	Rayfield	K.	No	No	.....	Pmp.	Cone.	2	Gear.	Wh.	2	2	1	101	No	4700	2¾-3½
4	Fowler	Wauk	4-3¾x5¼	1000	C-S.	P.	Zenith	G.	No	No	.....	Pmp.	Plate.	2	Spur.	Wh.	2	2	.....	.....	Yes.	3360	2-3
5	Martin*	Gall.	4-4¼x5½	1000	C-S.	P.	Holley	K.	No	Yes.	W	Pmp.	Cone.	3	Bull.	Wh.	2	2	2	86	No	5600	2
6	Pick	Own.	4-4½x5	800	Splash.	H.	Zenith	G.	No	No	.....	Pmp.	Cone.	3	Worm.	Wh.	2	2	2	90	Yes.	4480	2½
7	Glasgow	Cont.	4-4½x5¼	1200	C-S.	P.	Holley	K.	No	Yes.	D.	Pmp.	Cone.	2	Bevel.	Wh.	3	3	None	75	Yes.	4200	2
8	Martin†	Gall.	4-4¼x5½	1000	C-S.	P.	Holley	K.	No	Yes.	W	Pmp.	Cone.	1	Spur.	Ch-T.	2	.....	.....	.....	No	4200	2¼
9	Peterboro	Ric.	4-4¾x5½	900	F.F.	P.	Zenith	K.	No	No	.....	Pmp.	Cone.	2	Spur.	Wh.	2	2	2	87	No	4800	2½
10	Saunderson	Own.	2-5½x8	750	F.F.	G.	Own.	K.	No	Yes.	D.	Ther.	Cone.	3	Spur.	Wh.	2	2	2	90	No	5600	1½-2½
11	Saunderson Junx	Own.	2-5 x6½	950	F.F.	G.	Own.	K.	No	Yes.	D.	Ther.	Cone.	2	Spur.	Wh.	2	2	2	78	No	3360	2½
12	Wallis (British)	Rust.	4-4¼x5¾	850	F.F.	G.	Halliday	K.	Yes.	Yes.	W	Pmp.	Disc.	2	Bevel.	Wh.	2	2	2	.....	Yes.	3360	2½
13	Weeks	Wauk	4-4¼x5¾	900	C-S.	P.	Zenith	K.	No	Yes.	D.	Pmp.	Disc.	3	Bull.	Wh.	2	2	2	66	Yes.	3700	2½
14	Berna	Berna.	4-4½x6½	1000	Pr-Sp.	G.	Own.	G.	No	No	.....	Pmp.	Cone.	3	.....	Wh.	.....	2	2	118	No	7800	2-3
15	Ownitractor	Own.	2-6½x9	750	F.F.	G.	N.&P.	K.	Yes.	Yes.	.....	Pmp.	Cone.	2	.....	Wh.	2	2	2	90	Yes.	7500	2½
16	Santler	.....	2-5 x6	800	.....	P.	Own.	K.	.....	.....	.....	.....	.....	2	Bull.	Wh.	3	2	.....	.....	.....	5370	.....
17	Boon	Own.	2-5¼x7	800	.....	.....	.....	K.	No	No	.....	Pmp.	.....	2	Bull.	Wh.	3	2	1	84	No	5800	2 ½

*—Tractor; †—Self Contained Plow; **F. F.**—Force Feed; **Pres**—Pressure; **C-S**—Circulating Splash; **Pr-Sp**—Pressure & Splash; **G**—Gear; **H**—Hand; **P**—Plunger; **G**—Gasoline; **K**—Kerosine; **O**—Opt; **D**—Dry **W**—Wet; **Rol-S**—Rolled Steel; **Prs-S**—Pressed Steel; **Wauk**—Waukesha; **Gall**—Galloway; **Cont**—Continental; **Ric**—Ricardo; **Rust**—Ruston.

Exports of Automotive Parts 1907-1920

Not Including Engines and Tires

	1907	1910	1912	1913	1914	1915	1916	1917	1918	July 1 to Dec. 31, 1918	Calendar Year 1919	1920	Total, inc. 1908 1909, 1911
Europe:													
Austria-Hungary	$717	$2,511	$2,195	$4,572	$5,198	$1,045	.....	.....	.....	.....	$825	$363	$10,594
Azores and Madeira Islands	.....	50	99	720	1,384	1,800	$1,532	$1,270	$198	$1,600	1,909	4,094	14,723
Belgium	5,187	9,991	13,614	4,897	20,978	446	.....	.....	906	.....	141,974	246,585	448,903
Bulgaria	.....	.....	823	40	390	.....	.....	.....	.....	.....	307	89,697	91,428
Denmark	2,029	2,339	2,996	6,646	8,664	13,710	31,886	53,917	1,048	5,296	472,376	3,061,296	3,668,393
Finland	.....	.....	1,104	1,799	2,931	1,178	5,627	55	.....	.....	12,137	24,787	50,104
France	23,477	54,035	85,537	165,950	179,351	480,764	2,216,823	3,700,812	3,999,904	3,158,628	1,966,719	3,980,079	20,110,871
Germany	14,252	10,023	80,036	113,602	213,351	13,770	.....	.....	.....	.....	.....	3,972	502,683
Gibraltar	.....	57	100	.....	514	229	617	525	61	.....	834	6,166	8,269
Greece	.....	.....	454	379	807	2,010	24,724	12,604	4,675	13,415	102,715	113,077	274,387
Iceland and Faroe Islands	.....	.....	.....	17	180	880	456	2,608	2,757	3,385	13,661	11,903	31,847
Italy	5,502	4,421	6,304	14,156	50,580	65,521	115,260	180,977	99,947	26,195	100,078	360,856	1,061,192
Malta, Gozo & Cyprus Islands	.....	.....	.....	.....	.....	.....	.....	54	.....	.....	136	6,822	7,048
Netherlands	1,049	3,532	6,440	14,135	7,634	3,055	41,525	96,200	3,625	.....	286,540	454,966	926,091
Norway	400	2,684	934	1,636	1,893	15,607	59,769	100,542	18,855	65,253	385,508	483,741	1,148,185
Portugal	.....	394	865	920	2,357	3,239	45,356	66,929	20,274	11,770	58,031	176,328	388,186
Roumania	.....	.....	2,734	1,003	887	.....	391	.....	.....	.....	85,087	44,061	53,623
Russia in Europe	4,004	7,004	1,743	9,566	14,079	123,667	2,498,879	1,624,431	328,633	177	510	13,733	4,637,498
Serbia, Montenegro and Albania	.....	.....	113	.....	.....	.....	4,932	.....	.....	.....	350	.....	4,395
Spain	3,620	2,854	3,755	3,192	6,266	7,347	32,743	95,720	154,850	52,848	227,977	3,228,719	3,822,547
Sweden	9,748	3,818	3,789	4,276	6,140	4,211	37,917	26,891	4,032	.....	64,535	472,007	736,283
Switzerland	178	1,894	.....	457	1,069	400	1,150	565	54	.....	28,177	119,792	155,927
Turkey in Europe	.....	.....	964	116	.....	267	.....	.....	.....	.....	83,178	103,977	188,593
England		240,329	931,909	922,866	1,282,388	3,282,973	7,202,475	6,121,211	6,329,114	3,328,599	6,369,838	22,455,836	59,155,360
Scotland	*116,248	238	874	1,485	23,269	29,403	52,414	22,146	955	154,686	53,060	114,476	460,563
Ireland		54	523	451	250	208	7,181	1,264	.....	.....	16,481	61,382	88,150
North America:													
Bermuda	.....	.....	52	330	254	125	615	64	7	.....	125	219	2,045
British Honduras	193	73	165	509	163	684	548	1,379	2,638	1,839	6,183	10,090	24,911
Canada	195,989	1,023,368	2,392,592	3,104,097	3,663,879	2,741,178	7,492,639	9,148,110	12,054,824	5,677,029	16,865,619	21,635,691	88,196,698
Central American States:													
Costa Rica	255	2,376	1,320	4,516	6,208	5,041	10,162	7,498	23,613	1,924	8,217	20,024	93,035
Guatemala	24	2,124	2,062	1,851	1,613	732	2,367	9,852	9,111	2,882	20,078	47,260	107,972
Honduras	1,465	48	151	308	1,053	6,870	15,649	12,639	11,952	4,297	19,884	48,566	123,290
Nicaragua	160	38	86	741	47	609	666	964	2,264	4,894	26,930	56,222	93,711
Panama	274	3,180	4,689	11,738	16,988	25,861	34,180	56,657	72,180	26,403	88,546	116,274	394,352
Salvador	.....	526	2,790	2,242	2,481	2,371	3,717	11,314	10,179	4,206	43,915	45,593	131,372
Mexico	131,553	81,248	47,479	46,743	41,508	30,819	42,258	125,823	431,440	260,492	704,873	1,074,909	3,206,914
Miquelon, Langley & St. Pierre Is.	.....	.....	.....	.....	300	.....	25	5	65	29	279	69	772
Newfoundland and Labrador	132	1,508	2,026	2,993	3,901	3,632	8,672	9,972	4,129	5,245	26,196	28,582	104,474
West Indies, British:													
Barbados			3,209	5,055	4,177	4,216	6,383	14,452	15,089	7,192	25,902	38,735	128,276
Jamaica	†2,310	†14,085	23,569	25,355	24,693	32,337	53,867	54,854	65,429	22,071	92,521	196,302	628,495
Trinidad and Tobago			4,847	9,119	13,003	12,865	21,826	44,060	55,794	24,355	104,251	175,870	467,727
Other British			1,426	1,157	2,538	3,707	9,303	12,863	21,446	7,706	38,299	40,649	139,521
Cuba	18,095	49,088	31,594	35,928	48,217	101,429	411,731	906,710	1,028,277	566,079	1,582,241	2,288,292	7,165,557
Danish (Virgin Island of U. S.)	.....	.....	558	1,640	1,206	865	975	1,876	2,844	2,283	12,077	27,642	52,005
Dominican Republic	.....	253	3,381	1,331	3,439	3,633	12,389	35,301	39,816	44,189	88,744	241,873	475,509
Dutch	.....	.....	281	1,767	2,754	4,598	3,288	6,052	4,707	1,490	5,435	7,441	38,055
French	50	101	97	198	8,099	7,423	9,546	24,672	53,518	17,495	83,474	68,954	273,939
Haiti	.....	.....	331	2,212	1,095	185	3,285	3,962	24,385	7,949	49,922	68,920	162,361
South America:													
Argentina	10,137	22,150	70,446	74,138	92,663	49,990	222,637	1,458,111	3,088,534	706,571	3,753,370	7,263,624	16,850,190
Bolivia	190	.....	25	172	1,209	2,880	3,453	11,864	14,533	4,891	18,519	19,076	77,102
Brazil	8,665	7,802	35,680	108,859	84,602	28,633	59,935	134,326	233,414	103,834	806,556	3,144,122	4,779,414
Chile	3,527	663	2,656	4,711	22,405	14,721	72,939	248,043	806,015	359,668	586,031	426,563	2,553,303
Colombia	17	2,286	7,681	18,676	19,970	9,695	18,967	27,777	40,717	8,549	77,159	216,772	455,444
Ecuador	.....	613	3,461	9,115	6,324	4,458	8,014	12,648	12,964	4,251	21,949	49,376	134,061
Guiana:													
British	.....	1,303	3,181	3,809	4,583	5,116	6,809	23,597	35,081	23,882	40,460	46,122	196,935
Dutch	.....	7	12	39	911	1,702	2,052	3,212	3,282	1,872	5,511	15,153	34,353
French	.....	.....	6	125	.....	165	328	11	2,337	17	307	191	3,487
Paraguay	.....	.....	32	.....	.....	1,030	848	228	698	21	1,978	8,694	13,619
Peru	1,666	1,884	1,604	2,550	5,982	4,727	5,458	27,332	88,098	61,925	173,348	434,784	813,035
Uruguay	.....	1,390	12,599	32,978	21,401	14,359	27,086	125,913	183,005	47,408	372,223	608,269	1,466,360
Venezuela	.....	9	4,648	20,123	36,286	28,750	40,783	87,768	57,873	28,842	110,496	212,835	630,037
Asia:													
Aden	.....	.....	.....	502	1,676	361	998	4,541	263	6	7,578	12,344	28,269
China	690	845	2,254	3,134	5,825	5,265	21,661	54,753	60,134	39,714	175,579	302,258	678,075
Kwantung (leased territory)‡	.....	.....	.....	.....	.....	.....	46	1,747	672	855	63,831	11,337	78,191
Chosen	.....	.....	748	2,271	2,791	282	10,377	2,125	2,812	9,506	39,603	82,934	153,989
East Indies, British:													
British India	2,444	6,387	14,568	18,336	47,923	44,735	129,562	345,855	294,909	99,819	493,188	1,411,866	2,890,093
Straits Settlements	1,343	1,172	5,273	14,660	25,100	20,388	39,025	70,043	69,968	66,920	151,991	583,215	585,489
Other British	.....	170	829	901	4,099	4,062	8,540	27,710	23,273	4,100	13,319	95,321	183,081
Dutch	1,758	4,577	3,452	11,453	15,368	15,232	34,638	193,225	192,430	338,429	488,705	1,041,283	2,353,480
French	.....	.....	.....	.....	.....	274	.....	.....	1,998	2,367	9,356	42,210	56,205
Hongkong	123	290	2,711	92	626	1,088	2,180	2,885	7,702	9,764	27,277	44,338	99,743
Japan	5,021	3,375	39,681	51,619	35,637	26,028	30,446	116,130	319,038	235,317	719,460	624,805	2,212,638
Persia	.....	.....	.....	.....	.....	174	.....	.....	1,090	3,080	270	8,415	13,029
Russia in Asia	.....	67	.....	.....	.....	107,351	226,255	146,083	25,512	.....	194,613	18,265	718,887
Siam	2,134	921	978	1,925	4,905	2,451	34,412	9,734	7,639	3,708	9,479	13,909	94,644
Turkey in Asia	.....	.....	30	239	67	214	.....	.....	.....	3,764	5,552	83,225	76,661
Oceania, British:													
Australia	3,826	21,533	102,427	166,176	202,363	199,154	389,690	753,309	1,052,986	963,753	1,462,330	1,855,174	7,258,036
New Zealand	25,625	5,150	26,095	37,438	53,644	48,111	176,618	285,654	309,658	243,468	529,000	1,205,309	2,965,220
Other British	.....	.....	971	479	1,060	665	1,991	4,751	4,674	2,713	8,330	10,461	36,406
French	.....	.....	495	3,032	7,560	5,730	5,640	4,383	6,272	2,435	9,906	7,424	54,077
German	.....	.....	.....	220	396	.....	66	936	7,138	2,107	7,961	9,037	27,919
Philippine Islands	4,168	17,154	62,631	53,434	69,933	40,228	63,756	116,670	178,036	198,489	600,646	859,396	2,336,762
Africa:													
Belgian Congo	.....	.....	.....	.....	.....	.....	34	.....	.....	.....	7,893	1,896	9,823
British:													
West	.....	.....	56	465	5,743	6,537	20,311	64,938	49,077	29,807	141,902	348,473	576,309
South	3,000	14,655	29,123	62,304	157,246	100,240	286,401	422,200	811,323	195,714	878,723	1,625,438	4,606,743
East	.....	2,473	851	1,444	3,203	3,929	11,371	9,599	23,290	4,570	35,158	52,461	149,330
Canary Islands	.....	76	13	879	1,505	1,939	2,111	3,261	1,300	645	1,018	66,738	79,538
Egypt	110	277	99	295	130	1,494	4,751	2,623	716	.....	27,886	104,582	143,522
French Africa	.....	.....	327	73	200	2,660	2,458	2,316	7,163	18,146	64,201	117,272	215,155
German Africa	.....	.....	.....	.....	999	522	21,098	.....	.....	.....	1,820	7,609	32,048
Liberia	.....	.....	.....	.....	.....	13	.....	33	106	.....	66	100	318
Madagascar	.....	.....	.....	.....	.....	.....	.....	4	175	40	.....	686	905
Morocco	.....	.....	.....	.....	166	3,386	9,928	2,431	7,347	1,350	48,455	39,104	112,167
Portuguese Africa	.....	47	910	1,222	1,585	3,431	7,064	5,339	1,160	703	2,529	44,085	68,302
Spanish Africa	.....	.....	.....	.....	.....	103	.....	.....	.....	.....	.....	351	454
Other Countries	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	328,359	328,359
Grand Total													$257,288,041

*Included in totals of exports to England. †Included in totals of exports to Jamaica. ‡Previous to 1918 listed as British, French, German and Japanese China.

The Trend of Airplane Design

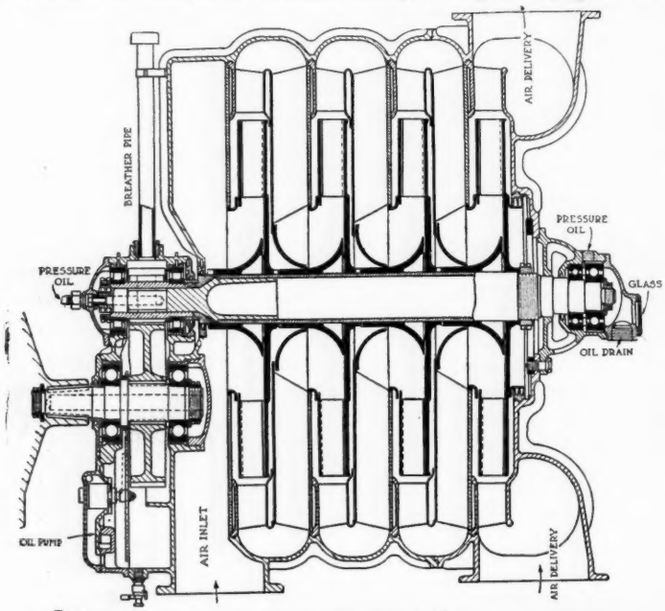
Those who recall the airplane trend article in the Statistical number of 1920 will be especially interested in the opinions on this page. The accuracy of last year's forecast makes no recommendation necessary this year.

THE year just past has been a period of re-adjustment for aircraft. The requirements of commercial aviation have been largely filled by surplus war material. General business conditions have made these requirements small. Designers have been studying the characteristics of planes developed during the war and the data accumulated is being incorporated in new designs. Those considering aviation a get-rick-quick game have left. Those remaining have chosen aviation as a life proposition, and have set out seriously to solve its problems. With the return of normal times the industry will be on a firm basis, ready to expand conservatively as conditions warrant.

Foreign Influences.—It is unfortunate, but true, that a tendency has existed to belittle American designs as compared with Continental designs. Since the war it has been possible to study these designs in direct comparison with our own. And all things considered—ease of manufacture, upkeep, air qualities, life—the coming conclusion is that American designs and American methods are best for Americans.

Early in the year the foreign all-metal monoplane led the field. From the apparent advantages, here was a machine that was fireproof, durable, efficient and well adapted to commercial use. Several of them, however, have been burned, and the problem of holding thin metal sections together under vibration has not been solved.

Startled by the evident advantages of all metal construction, American designers and constructors hastened to experiment with it in their own designs. It was found that the best metal—duralumin—was not easy to procure or simple to handle except in quantity production. Quantity production is at present lacking and the advantages of this construction are not sufficient for its extensive use at the present time.



Latest design of the Brown-Boveri blower for 1200-*hp. installation*

Metal Construction.—Metal construction, however, will increase, as American manufacturers become more familiar with its manufacture and airplane builders are organized to handle fabrication. There are serious construction problems to solve. In the meantime wood and metal construction will hold its own.

Monoplane, Biplane or Triplane.—Whether an airplane should have one, two or three supporting surfaces is still an open question. It can be no more arbitrarily settled than can the proper number of cylinders for a motor car engine. The present tendency, however, is toward internally braced monoplane design.

The internally braced monoplane is the cleanest and most efficient aerodynamic structure. Thick wing sections have been and are being developed that are extremely efficient. One interesting example of this type is the Stout bat-wing monoplane. A small commercial machine, having a veneer covered internally braced wing has been constructed and flown. A similar military machine of duralumin is in process. The feature of this type plane is that all longitudinal sections are lifting sections.

There is at present a slight trend toward the parasol type of monoplane—internally or externally braced. This construction provides maximum wing area for the span; permits continuous wing structure and provides good vision.

The majority of designers still favor the biplane type because of the combination of desirable features—moderate span, good air characteristics, adaptability to wooden construction and familiarity. This type will continue popular. At present all speed and distance records are held by biplanes, both here and abroad.

One of the fastest and cleanest of American planes—the Kirkham—is a triplane, and the large flying boat under construction by the Navy Department is reported to be a triplane.

Large Planes.—The trend toward large planes seems to be dying down somewhat. The development is retarded by lack of large power units and suitable landing fields. Possibly the largest under construction is the C.B. flying boat being made by the Navy Department. This will weigh around 70,000 pounds when complete, and be powered by groups of Liberty engines. The Army is also reported to have a large plane under construction. Under present conditions the reasonable upper limit of size appears to be approximately 100 ft. span and 5-7 tons total weight, depending on whether it is a land or seaplane.

Small Planes.—Small, that is, really small planes, have not proven as popular as was expected. Such planes are ordinarily without much purpose, and few experienced flyers fly simply for the sake of flying. There is, however, one comparatively small plane—the Sperry Mes-

(*Continued on page* 414)